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To Lili, Leona, and Adrian

Preface

Business Analysis is increasingly becoming an interesting field of work. It was born in an era heavily influenced by waterfall methodologies and has not only survived the transition to agile but is becoming increasingly important to businesses. It seems that many people, holding different job titles, find their day-to-day work incorporates more and more "business analysis" activities. Secondly, with the increased presence of digital technologies now affecting the majority of new solutions, people need to have one foot in business and the other in IT. On the one hand, they need a better understanding of how solutions incorporating digital technologies are going to be used, how they will deliver value and become better acquainted with the customers' perspective. At the same time, they need a better understanding of the capabilities of IT and to find sharper designs to deliver expected value. Those working mainly on the business side find themselves increasingly immersed in technology-driven discussions, and those on the technology side are involved in the early stages of product ideation. Good solutions are born when both sides are involved and aligned with each other. In addition, business analysis activities are now, more than ever before, a concern of managers as well. Managers are finding themselves increasingly discussing aspects that are encompassed by business analysis. In a discussion with an experienced and seasoned manager, I was told that 15 years ago, IT related discussions comprised about 15% of his agenda, whereas today, it is closer to 80%.

There is an increased demand for persons who have their expertise in business or IT but are able to adapt to either task. These resources exist, but they have been schooled by experiences accumulated at work, by taking corporate training courses, or having read up on the topic. After having worked for more than 18 years with business analysis, having trained new employees in business analysis, and taught the subject to numerous students at the university level, one thing has become increasingly apparent. There are no textbooks that cover the main aspects of BABOK [35] while providing students with examples and case studies, suitable as course literature or self-study, particularly in the context of digital technologies. This is not due to a lack of very good books on business analysis—there are many—but rather that they either focus on a specific aspect of business analysis or are excellent as reference books.

BABOK [35] is an impressive body of knowledge and gathers together the relevant aspects of business analysis in one book. While it is comprehensive, it neither aims nor tries to cover the topics in more detail. While it has limitations for use as course literature, it is invaluable as a reference book. In a similar vein, the book entitled Business Analysis [15] covers the business analysis process and an impressive list of different tools and techniques. The authors have also written a complimentary book that briefly introduces 99 business analysis techniques [14]. Again, these are valuable for experienced business analysts who need to quickly find a brief overview of different techniques.

Other excellent titles such as Seven Steps of Mastering Business Analysis [16], The Business Analyst's Handbook [70], Business Analyst's Mentor Book [101], and Business Analysis for Practitioners [76] either focus on certain aspects of the business analysis process or share very interesting insights born out of years of experience. As such, they should be on the reading list of every aspiring business analyst. However, it is difficult to build a course on such titles. At a more specialized level, there is an impressive list of titles that deal with certain aspects of business analysis, specifically on the topic of business analysis and agile methods. A few examples are The Power of the Agile Business Analyst [20] and The Agile Business Analysts: Moving from Waterfall to Agile [51]. Other titles such as Business Analysis and Leadership: Influencing Change [78] deal with the complicated aspect of change and business analysis. Other titles focus on different aspects of business analysis work such as requirement management [72, 82] or business process management [22].

In the light of this context, a textbook is required that:

- Covers many of the aspects of business analysis work with enough detail and examples to allow for both self-study and as a basis for courses on business analysis.
- Covers the entire business analysis process from external business context to solution evaluation, and the main principles of good business analysis work.
- Contains numerous illustrative examples and classroom-tested case studies for students to test their skills and for instructors to use in class as a basis for discussions or homework/assignments.
- Is aligned with BABOK.
- Frames business analysis within the context of digital technologies.

For further help and assistance to both students and instructors of business analysis, this book is accompanied by the website (https://babook.cs.ut.ee) that includes additional resources. This book would not have been made possible without the help of all the students who critically, and with a posture of learning, engaged in discussions during class work and offered valuable feedback on the cases and the contents of this book. Furthermore, a special note of gratitude is owed to Maria, Lilit, Nino, Ahti, and Marit for their invaluable assistance with various aspects associated with these courses and this book. A special mention is due to Prof. Marlon Dumas for his support, encouragement, and special skill set that

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Chapter 1
Introduction to Business Analysis

What is business analysis and who is a business analyst? This role and profession have grown considerably in past decades. It is not uncommon to find job ads seeking junior or senior business analysts. This growth clearly indicates the increasing realization in the industry of the importance of such a role. In simple terms, a business analyst is someone whose work involves business analysis. In essence, the work of a business analyst pivots around delivering solutions, mainly supported by information technology, that bring value to stakeholders. Information technology will enhance the performance of a process. However, if the process is poorly designed or not tailored to solving the problem, the solution enabled by information technology will increase the problems rather than solve them. On the other hand, if the process is soundly re-designed, information technology will enhance the value for the stakeholders. In other words, information technology has the potential to deliver great value but only if it is aligned and synchronized with the business needs. It is precisely this aspect that business analysis safeguards, namely ensuring that the solution addresses the needs, enabling information technology to create value. Digital business analysis frames the above stated within the context of digital technologies. Although the foundation of business analysis remains the same, a new set of capabilities, more modern business analysis techniques, and a mindset of continuous learning is required for digital business analysis.

The role of information systems has grown and assumes a greater role than most, if not all, initiatives to incrementally change or transform business processes. In particular, in recent years we have witnessed the spread, establishment and growing role of digitalization in almost all aspects of businesses. The digital reality and its capabilities have already proven to be extremely valuable when applied in a manner that is aligned with the business context and needs. With the continued growth of digitalization, the need for a business analyst who can deliver solutions that bring value and understand digitalization, will be particularly valuable and needed. The aim of this book is to present the fundamentals of business analysis from the perspective of digitalization.

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1.1 Origins of Business Analysis

It is worthwhile to consider the origins of business analysis to understand its roots and how it has evolved. Business analysis grew with the proliferation of using information systems in businesses during the 1980s. Prior to this, most companies did not use information systems to support their processes. However, many projects failed completely, others exceeded estimated time and budget, and perhaps worst of all, failed to deliver the expected value for the business. Many businesses saw the long delivery time of IT projects as highly problematic. There was little doubt about the value of information technology, but projects seemed to be plagued with re-writes, changes and additions to functionalities. It gradually became clear that communication between the business and the IT was essential for project success. Gradually the need to be able to articulate and communicate the requirements of the business side to the programmers grew, and the role of a business analyst was born. In the light of the information age that began in the 1980s, an important role for the business analyst was to understand how and what data could be used to improve processes and ensure delivery of better returns from IT investments. This required a good understanding of the business needs and the ability to communicate it to the software developers. Due to this, business analysis in its early days was primarily focused on formulating and communicating requirements. However, since then, the role has grown [1].

In analyzing the business, the focus has moved beyond requirements to including the reasons for change (business drivers), the desired effect to achieve (business goals), identifying what components need to be changed or replaced in order to reach the objective (business deliverables), the requirements (business requirements) and what needs to be adapted or changed in the business (business rules), as presented in Fig. 1.1. As the complexity of business has grown and new methods have emerged, the role of the business analyst has grown to increase its focus on business processes and the adoption of agile practices. Perhaps it can be said that the role of the business analyst has grown from a mere formulation of requirements to the work performed prior to the requirements, stretching into analysis aiming at unraveling the real needs, root causes, and assessment of alternative solutions. This also gave the impression that all problems or needs do not necessarily require an information system solution. The conclusion might very well be that the best way to achieve the desired objective could be achieved with process change rather than information system changes. As such the analysis covers the reasons for the change, considers the options to resolve the problem and works with its implementation and the evaluation.

As business analysis has matured and its importance become more rooted, so has the role. Top level business analysts work increasingly with a portfolio of projects. Rather than focusing on one project, consideration is given to managing a portfolio of projects to assess, prioritize, and ensure that the "right" projects are implemented so as to enable the company to achieve its strategic objectives. A junior business analyst will primarily work on eliciting and defining requirements and be more

Fig. 1.1 Evolution of business analysis

actively involved in projects. A business analyst might be more involved in the stages before an official project is launched to assist with analysis required to ensure the right problem is being solved. A senior business analyst works at a higher level and tries to find the best match of projects to enable the company to achieve its strategic objectives. Most companies that have grown beyond a certain size will have senior business analysts.

1.2 What is Business Analysis?

There are many different understandings of what business analysis is and what a business analyst does. Although several definitions have been proposed, most of them revolve around the concept of delivering solutions that have value for a stakeholder. The IIBA defined the discipline of business analysis as "a set of tasks and techniques used to work as a liaison among stakeholders in order to understand the structure, policies, and operations of an organization, and to recommend solutions that enable the organization to achieve its goals" [2]. From this definition, we discern that a business analyst recommends solutions to problems or addresses a need with the aim of achieving a pre-defined goal. However, in the latest version of BABOK, the definition has been refined to the "practice of enabling change in an enterprise by defining needs and recommending solutions that deliver value to stakeholders. Business analysis enables an enterprise to articulate needs and the rationale for change and to design and describe solutions that can deliver value" [3]. Accordingly, at the core of business analysis is the work of finding solutions that address the needs for the purpose of delivering value to some entity. In other words, it simply means to analyze needs or problems of a specific business for the purpose of finding and implementing a solution.

A business analyst is someone who performs business analysis tasks. As such, the job title is secondary to the kind of work that is performed. The business analyst is someone who is responsible for and works with "discovering, synthesizing, and analyzing information from a variety of sources within an enterprise, including tools, processes, documentation, and stakeholders" for "eliciting the actual needs" [3] for the purpose of recommending solutions that address these needs. Anyone working systematically with such tasks is doing business analysis even if they carry

the job title of business system, data, system, process or enterprise analyst, management consultant, product owner or software product manager.

The business analyst performs the work of business analysis in different contexts and levels. The tasks can be performed on levels ranging from strategic to operational or it can be confined to a single project aiming at improving a specific part of the business or involving several divisions of an organization. It can be concerned with introducing new solutions or continuously improving existing solutions. More often than not, the business analyst works with a change in one or more information systems. In short, business analyses, regardless of the multitude of forms it can take on, is about understanding the actual problem or need and, through a set of activities and analysis, recommending the best solution that will resolve the problem or satisfy the need of the stakeholders.

1.2.1 The Business Analysis Core Concept Model

We defined business analysis as the "practice of enabling change in an enterprise by defining needs and recommending solutions that deliver value to stakeholders" [3]. Notice the key words: change, enterprise (context), needs, solutions, value and stakeholders. These concepts are fundamental and recurring in the work of business analysis regardless of industry, method, and project type or if the project is at levels ranging from enterprise strategy to tactical implementation. These core concepts, change – need – solution – stakeholder – value – context, make up the conceptual framework for business analysis called "Business Analysis Core Concept Model" (BACCM). The core concepts are described below:

- **Change**: The act of transformation in response to a need.
- **Need**: A problem or opportunity to be addressed.
- **Solution**: A specific way of satisfying one or more needs in a context.
- **Stakeholder**: A group or individual with a relationship to the change, the need, or the solution.
- **Value**: The worth, importance, or usefulness of something to a stakeholder within a context.
- **Context**: The circumstances that influence, are influenced by, and provide an understanding of the change.

Change, the main output of business analysis work, aims at making improvements to one or several aspects of an enterprise. Most commonly, changes are driven by some problem or **need** in an enterprise. However, changes in the situation of the enterprise, such as new competitors or new products, might also give rise to the need for some form of change. The needs are satisfied in a specific way, i.e., a solution. The **solution** causes a change that satisfies a need and makes an impact on **stakeholders** who have some form of interest in the matter. The solution brings some kind of tangible and/or intangible **value** that can either be measured directly

and/or indirectly. All of the above takes place within a **context** of factors. Such factors might be industry trends, regulations, organizational attitudes and culture, or enterprise-specific factors (financial, product, process, and/or technology).

The work of the business analyst is about the relation of these concepts i.e., recommending solutions that address a need in such a way as to produce value for a stakeholder within a context. As such, these concepts are guiding stars in all areas of the business analyst's work. These concepts are, therefore, interdependent and are best understood collectively (see Fig. 1.2). No single core concept precedes or outranks any of the other ones.

Let us consider an example and how the BACCM captures the different aspects of the business analysis work. Let us assume an organic berry fruit bar producer wished to expand their business and therefore needed to find new berry suppliers. The company must have traceability of the berries to ensure they are organic and to be able to track each batch from the supplier all the way to the stores. To this end, they need a solution for tagging and tracking the journey of the berries, from the field to the packaged fruit bar sold in stores.

In this context, there is a need to have tracking. This need arises from the current situation wishing to expand but maintain control over the quality of the berries. The next component is the solution. The solution will only be useful or relevant if it satisfies the needs by providing value. In this case, the value is related proper tracking and ability to trace the berries forward (to the fruit bar in each store) and backwards (where the berries in a given fruit bar came from). The value is delivered, and the benefits of the solution are enjoyed by stakeholders. In this example, the stakeholders might have been certifying agencies, stores, or the quality assurance department of the fruit bar company. However, the need and the solution that deliver value for certain stakeholders must fit in within the context. One solution might be

Fig. 1.2 BACCM framework (based on [3])

very good for one fruit bar company whereas it would not work at all with another one. Finally, in order to deliver a solution that resolves a problem to deliver value for a stakeholder within a context, a change is required. In this case, it might be new software enabling traceability used by all stakeholders along the journey of the berry.

The BACCM framework can be used for describing and defining the work of business analysis as it correlates and further explains the definition of what business analysis is. Furthermore, it can help us understand the relationship between these concepts when conducting different tasks of business analysis. It might be used to evaluate that all relevant results are considered when working with a specific knowledge area or assess the quality and completeness of the deliverables. When conducting an analysis of the current state the analysis can be evaluated against the core concepts to ensure that all these aspects have been considered. The quality and completeness of the analysis can be further tested by considering the internal relations between the core concepts. As the core concepts are inter-dependent, it follows that any significant change in any of the core concepts (within the scope of the business analysis project) will have an effect on other concepts. In such cases, the core concepts can assist in securing that all relevant aspects are considered and re-evaluated.

1.2.2 The Business Analysis Body of Knowledge

In 2003, the International Institute of Business Analysis [2] (IIBA) was formed as an independent non-profit association for business analysts. It has, since then, steadily grown to encompass more than 29,000 members (2018). Today, the IIBA is the leading association for all who work, at different levels and capacities, as business analysts. One of the main contributions of the IIBA is BABOK (Business Analysis Book of Knowledge). BABOK is now the recognized standard of business analysis practice, encompassing all areas of knowledge including tools, skills, competencies and aspects for good business analysis. As BABOK is the standard, this book is aligned with BABOK (version 3) and can be used as an introduction to business analysis.

The purpose of the BABOK Guide [3] is to be the standard for the practice of business analysis. The BABOK Guide defines the business analysis profession, captures, describes and lists knowledge areas, associated tasks, skills and a repository of tools and techniques necessary to effectively perform business analysis. It also functions as "a guide to the business analysis body of knowledge" [2] for business analysts, and is an important resource for anyone who works in business analysis.

The BABOK Guide begins with "Business Analysis Key Concepts" which provides definitions of terms and concepts (such as BACCM discussed previously). Following this, the BABOK Guide organizes the business analysis tasks into the following six knowledge areas:

- **Business Analysis Planning and Monitoring**: This knowledge area gathers all activities that are performed for the purpose of organizing and coordinating the work that is to be done.

- **Elicitation and Collaboration**: This knowledge area collects all tasks related to planning, preparing, and performing elicitation activities and to confirming the results.
- **Requirement Life Cycle Management**: This knowledge area describes tasks related to requirement management from their inception to completion.
- **Strategy Analysis**: This knowledge area encompasses all tasks required for understanding, identifying and analyzing the business needs including what is required to address those needs.
- **Requirement Analysis and Design Definition**: This knowledge area covers the tasks to structure and organize elicited requirements, and design the recommended solution.
- **Solution Evaluation**: This knowledge area lists the tasks performed for the purpose of evaluating and improving the value delivered by a solution.

Each knowledge area describes its main components by stating its purpose, inputs, elements, resources required (guidelines and tools), the list of techniques that can be used, the stakeholders involved, and the outputs of each task.

Following the knowledge areas, the BABOK Guide lists and explains the underlying competencies reflecting the skills, knowledge, qualities required to perform business analysis work (those defined in the knowledge areas). Each competency is elaborated by describing its purpose, definition and how to determine if a person masters the competency. The final part of the BABOK Guide lists 50 techniques (not an exhaustive list) describing different ways the tasks of the knowledge areas can be performed. For each technique, its purpose, description, elements and usage considerations are briefly discussed.

Finally, the BABOK Guide describes five major perspectives that are used in the business analysis that is more specific to the context. These are Agile (when projects are within an agile environment), Business Intelligence (work in the context of transforming, integrating, and enhancing data), Information Technology (work in the context of information system), Business Architecture (work in the context of higher levels involving architecture of a business), and Business Process Management (within the context of business process development and/or improvements).

1.2.3 The Business Analysis Process

Business analysis varies from project to project and each project has its specific context. Accordingly, a business analyst may perform selected tasks from the knowledge areas of the BABOK Guide in a sequential order, iteratively or even simultaneously. The analyst might also perform other activities not listed in the BABOK Guide. In short, there is no prescribed sequence of how the tasks are to be performed. A project might be of smaller size and therefore, several tasks are performed simultaneously whereas another project is significantly larger and requires a

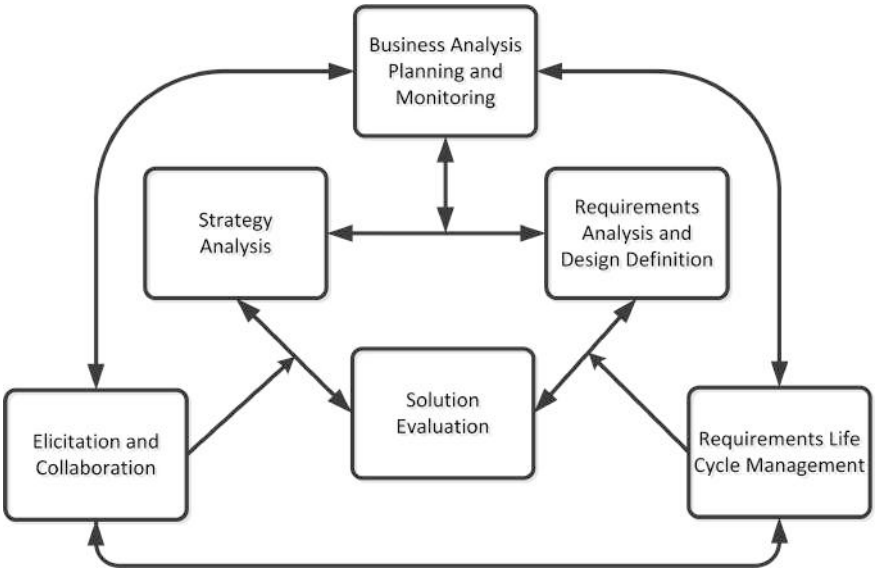

Fig. 1.3 Relationship between knowledge areas (based on [3])

more systematic approach. It is also possible to analyze the current state and then define the problems but also equally effective to first define the needs followed by a current state analysis. Consequently, the BABOK Guide does not prescribe any order in which the tasks of each knowledge areas are to be applied. The interaction and relation between the knowledge areas are more iterative as illustrated in Fig. 1.3.

The iterative nature is part of the work. If the project is fairly contained and small, the tasks of several knowledge areas might take place in a day or two. In such cases, it is possible that current state analysis, problem analysis and defining the future state are performed seamlessly as if it was one activity. However, if the problem is complex and many processes are involved, it might take months before a project can be started. It is also probable that new information emerges, making it necessary to re-visit previously completed tasks. The tasks are not completely independent of each other, but they do not come with prescribed instructions as to in which context they are to be used. The analyst will use these tools depending on the context.

1.2.4 Activities of the Business Analysis Process

Every project will be different in regard to what activities are performed, which tools, techniques, and methods are applied. It is a dynamic process at work. As such, the work can be understood as a process with different steps, each covering a set of activities that move a step closer to the final outcome. There are different

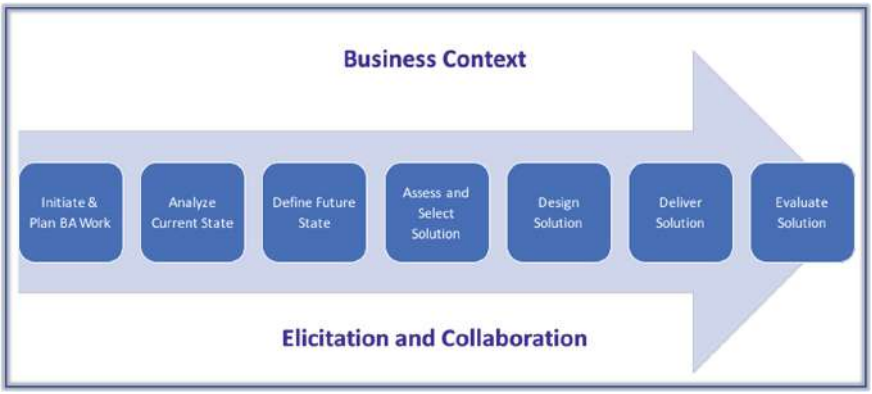

Fig. 1.4 Business analysis process

suggestions as to how such a process looks but most share a common set of core steps. The business analysis process presented in Fig. 1.4 is fundamentally a synthesized and adapted version of some available alternatives.

The process begins with a stakeholder perceiving there to be a specific problem that needs to be solved, a need that should to be fulfilled or an opportunity, if taken, that has potential value. When the business analyst is involved, he or she has to initiate and plan the work ahead. The analysts' next step is to consider the business context and perspectives when planning the business analysis work. Once the preliminary plan has been set, the current state is analyzed. This step also includes gaining a clear understanding of the problem, needs or the opportunities. Following this, the analyst can begin defining the future state (how it is desired to be) and generate alternative solutions. Next, the solutions are compared, evaluated and the most suitable alternative is selected. Following this, the solution is designed in more detail and delivered (implemented). Finally, the solution is evaluated to ensure it delivers the intended value.

It is important to note that the business analysis process does not rigidly follow the described steps. The process will depend on a number of factors such as the size and complexity of the problem, the effort required to deliver the solution, and standards adopted by the company. Although the work of an analyst might not follow a clear process with easily defined steps, it is helpful to think of the work as a process for our purpose of introducing business analysis.

1.2.4.1 Business Context

All organizations operate within a business context. The business model, values, strategic direction and policies of the organization affect the steps of the business analysis process. It will be necessary for the analysts to be acquainted with that context. If the company has a business model that depends on successful customer

management (such as private banking firms), they would prioritize quality over costs. However, if a bank manages large volumes of transactions and seeks operational efficiency (traditional banks), the priority would most likely be on costs rather than quality. Let us consider another example. A business analyst is tasked with eliciting requirements for a project. Larger companies often adopt a specific method for their software development process. One company may follow an adapted version of the waterfall method, as their information systems are very large, complex and integrated with many other systems. Another might choose an agile approach. Regardless of the method used, requirements have to be elicited. However, the way the requirements are modeled and documented will depend on the software development methodology. As such, the internal context affects the work of the business analyst as well.

1.2.4.2 Analyze Current State

The objective at this stage is to acquaint ourselves with the current state in order to uncover the real problems or issues, and to define the stakeholders' perspectives. By using available documentation (such as work instructions) and interviewing the people involved in the processes being examined, the analyst is able to analyze and capture the current situation. During this phase of the process, the problems or needs of the business are closely examined to ensure that the "correct" problems and needs are identified and defined. Different stakeholders may have interests, and are affected by the problem or the solution, and it is important to capture their perspectives as well.

1.2.4.3 Define Future State

The main objective of this stage is to identify relevant and appropriate solutions to the problems or needs. We know the current state or the "as is" model and the problems or needs are defined. At this point, the analysis can proceed with what one wants to achieve and begin by discussing the future state (also called target state) or "to be" situation. With an understanding of how it is "to be" and contrasting this with the "as is", gaps can be identified, analyzed and different solutions (how to get from "as is" and arrive at "to be") can be discussed. In essence, this stage is about mapping the current situation, figuring out what the desired situation should be, and develop alternative solutions to address the identified problems.

1.2.4.4 Assess and Select Solution

The purpose of this step is to select a solution from the short list of alternatives. The decision on which alternative might depend on the impact of the changes (benefits), constraints such as time or financial restrictions, the costs, the changes required to

achieve the benefits, the feasibility of the solution or other ongoing projects that engage resources needed. In this stage these parameters are considered, the business case (financial aspects) and the risks of the alternative solutions are analyzed and finally, a decision is taken involving all stakeholders, their input and feedback.

1.2.4.5 Design Solution

In this step of the process, the requirements of the solution are systematically gathered and documented. Requirements are descriptions and explanations of what is needed, wanted, or necessary for the solution. The business analyst has a responsibility to ensure that the requirements are complete, consistent, and relevant. This work is often referred to as "requirements elicitation" or "requirements engineering".

1.2.4.6 Deliver Solution

Once the solution is defined it is time to build and deliver the solution. The delivery of the solution can take many shapes. It can be a matter of organizational change that requires a set of meetings and distribution of information or changes to certain procedures. Delivery of the solution necessitates changes in information systems and requires setting up a project. In such cases the documentation produced so far is taken as input and the project organization works towards delivering the solution. A project manager takes the role of the "captain" while the business analyst assists as "navigator."

1.2.4.7 Evaluate Solution

Once the solution has been implemented and is being actively used, it should be evaluated. The investment is necessary to achieve certain objectives or goals and at this stage, an evaluation is conducted to assess how well the desired objectives have been met. Effective evaluation requires that certain metrics or success factors have been previously identified to which the outcomes of the solution can be compared. In addition, this step includes actively working with removing barriers that might prevent the realization of the full potential the solution can deliver.

1.2.5 Business Analysis Process and Knowledge Areas

As mentioned before, the tasks encompassed by the knowledge areas do not have any prescribed order they have follow. However, the knowledge area of "business analysis planning and monitoring" correlates very well with the first step of the

business analysis process, namely "initiate and plan BA work." The next three steps "analyze current state", "define future state", and "assess and select solution" overlap very well with the knowledge area of "strategy analysis." Similarly, the knowledge areas of "requirement analysis and design definition" overlap with "design solution." The delivery of the solution is typically performed (at least for larger projects) in a project organization in which business analysts are involved. At this stage, the analyst performs tasks from all knowledge areas depending on the need. Finally, the step "evaluate solution" overlaps with the knowledge area of "solution evaluation." The tasks of the knowledge areas of "elicitation and collaboration" and "requirement life cycle management" are present throughout the whole process. For instance, "elicitation and collaboration" covers tasks with eliciting and gathering information and is performed in all the steps of the process.

1.2.6 Types of Business Analysis Projects

Business analysis, defined as the "practice of enabling change in an enterprise by defining needs and recommending solutions that deliver value to stakeholders", can be applied to different types of projects. Some projects aim at exploring opportunities, others focus on operational improvements, and others focus on implementing a new IT system or decommissioning an existing one. Regardless of the project type, the analysis process shares many commonalities. However, they differ on the emphasis. For instance, projects conceived from an emerging opportunity might require more work assessing the market size and the financial aspects of tapping into the opportunity. On the other hand, projects aiming at improving processes would have a stronger focus on business process modeling, analysis, and re-design. Commonly, business analysts will work with the following types of projects:

- **Solving a problem**: Perhaps the most common project is to solve a problem. The management often has a perception of what the problem is, and sometimes the solution as well. In these types of projects, the analyst will have to ensure what the problem is, the impact and the best way to solve the problem.
- **Exploiting an opportunity**: A company might find a customer demand for a new product or feature, a new market for their existing products, or collaborate with a third party to improve their product offering. Regardless of the opportunity being explored, the analyst will consider the profitability of the case (benefits versus costs) and find the most optimal solutions to realize the opportunity.
- **Cost saving**: Another common reason for projects is reducing costs, by replacing manual jobs and/or associated costs with automated systems. Such projects are often very IT intensive, requiring the analyst to extensively work with requirement elicitation and process design.
- **Comply with regulations**: Yet another type of project is when a company has to make changes to comply with regulations. These projects are quite clearly

defined, and the analyst will predominantly work at understanding the regulations and what changes they require.
- **Commercial "off the shelf" product implementation**: Companies are increasingly buying software packages rather than developing it by themselves. The benefits are compelling, and many projects focus on implementing such decisions. The analyst will mostly work with aligning the internal processes with those of the software package alongside requirement engineering.
- **Data driven projects**: By using data to optimize their marketing strategies, companies are increasingly using this accumulated data to generate revenue growth.

Although a business analyst can work across different types of projects, it is essential to be aware of the current trends, possibilities and new capabilities created by advances in information technology and in particular the major trends. In the 1980s, information technology enabled data processing, and opened the way to support business processes with IT systems. In the 1990s, information technology enabled automation, which revolutionized, in particular, manufacturing companies. In the early 2000s, the Internet boom opened the way to an online presence and although many new Internet companies went bankrupt, the technology and its usage made significant footprints. In the digital era, the types of projects remain largely the same but digital technologies are infused into the solutions to deliver greater value.

1.3 Business Analysis in the Digital Era

A business analyst works with finding solutions that create value by solving a problem or taking advantage of an opportunity within a specific context. We are witnessing how this context is being infused with "digitalization" and in order stay relevant, the analyst must understand the new emerging digital context, learn to operate within it, and use its enabling power in finding good solutions.

1.3.1 Digitalization

The great advances made in information technology, the increase of availability and speed by which digital data can be transmitted has opened up a new world – the digital world or era. Established companies are being disrupted by new digital ones that offer the same services, but in a cheaper, faster, and more customer friendly way. The digital era encompassing technologies, devices or applications such as IT systems, mobile phones, and computers, provide access to information in ways previously not possible. The digital era is more concerned with the increased access and merger of information and its communication and connection rather than the

specific enabling technologies. Gartner defines digitalization as "the use of digital technologies to change a business model and provide new revenue and value-producing opportunities, it is the process of moving to a digital business" [4]. In this definition, digitalization enables the creation of new or changes in existing processes and business models that provide improved revenues. Digitalization is simply the ability to utilize ICT (Information and Communication Technology) to exploit new opportunities of creating more value.

Digitalization is transforming traditional business and opening up new opportunities to increase efficiencies and revenues while offering better customer service. Digitalization is affecting many industries and is changing the corporate landscape and the rules that apply. In this new digital era [5] the corporate landscape is moving from a predominantly "tangible flow of physical flows" to "intangible flows, of data and information"; "transportation infrastructure", having been critical for the flows are increasingly being matched by "digital infrastructure" and going from a world where "ideas diffuse slowly across borders" to "instant global access to information." These are some examples of the trends that are changing the business landscape. As companies exist and operate within such a landscape, businesses will also be deeply affected and therefore, also business analysts.

There are several ways to explore the impact of digitalization on traditional business models. Let us examine different ways digitalization has changed how companies conduct their business. Digital technologies have enabled separating data from the physical objects. Music, books, magazines, money and many other products that were recognized in their physical form, have now become digital. The implication of digitalization is significant. For instance, consider the cost of production of a music file versus a CD. The margin cost of the digital version is near to zero. If we consider storage and transportation as well, we see that this greatly changes the cost structures of companies. This also allows for retailing models that were not possible before. With physical products, shelf space was a limitation but with digital products, the whole connected world is the market space. Companies, like Amazon, have utilized these opportunities to the upmost possible extent. A large Bricks and Mortar bookstore carries between forty to a hundred thousand titles whereas Amazon and other online stores can carry virtually all books available. In the traditional way, the bulk of revenues came from best sellers. The stores had limited space and therefore, would focus on best sellers. However, digital technologies enable niche and rare books, songs, magazines that can be easily found. While these sell in small quantities, the large number of products makes it profitable. In other words, summing up, a large number of products that sell in small quantities add up to quite considerable revenues [3].

Yet another aspect is data and its ability to be cheaply stored, sent, accessed, and shared so that it can be available at all the places it is needed. The cost of sharing data is virtually zero. In the traditional system processes and structures, information was stored at one place and in one system. Although others (systems) could access the data, it was costly and not that simple. With the aid of shared databases and the cloud, data can be accessed from virtually any point of the globe. Data can be moved quickly and at very little cost. Previously, complex work was conducted by

experts whose knowledge and expertise were crucial when performing difficult tasks. However, with the development of expert systems, this knowledge and expertise has moved into systems, offering decision support that is often better than what the experts can. This is enabled by systems that have incorporated the "knowledge" into their processes. Similarly, managers used to take most decisions. However, decision support embedded in process aware systems allows to integrate decision making with the work performed. In fact, in many cases the decisions are no longer taken by humans but have been defined as business rules in information systems.

Digitalization has also allowed work to be detached from a specific physical space. In the pre-digital era, employees needed fixed physical spaces for interaction with other divisions or customers. Being face to face with the customer was considered to be the best contact. If a customer was to be shown something, it was at the desk of the sales representative. Personal contact is no longer the only or even the best way. Virtual contact with customers is not only possible but many times preferred as it saves time and is far more convenient. In the pre-digital era, the customer who wanted to check the balance of their bank account, had to go to the bank and wait for their turn to talk to a clerk. However, with the connected world, by means of a wireless connection, laptops, notepads, and mobile apps, the customer has access to all data and functions from any location. Likewise, the sales representatives can, using these devices, access all data, functionality, and systems from wherever they are.

The digitalization has also shifted the work of finding information to receiving information. In the pre-digital era, if one wanted to know where a certain item was, such as an item being shipped, it was a question of investigating and finding out. Likewise, if someone wanted to know how a certain business unit was performing, who the main customers are or any information that required some processing of data, they had to investigate and compile the results. Digitalization has shifted this from investigating to receiving such information in real-time. Consider the tracking of physical objects. Using RFID and wireless, there is no need to investigate where an object is. The objects "tell you" where they are. There is no longer a need to compile reports as data is now available in real-time which allows for instant snapshots of the current state. Dashboards show how the company or a process is performing right now. With digitalization, more data is available than ever before, and companies can utilize the data generated to analyze, predict, plan, and adapt to the changing needs and context in which they operate. In fact, big data analytics is an essential part of all young companies operating in the digital sector. Such fledgling companies have also invested heavily in big data, as the benefits are simply overwhelming.

Digitalization has also disrupted the traditional trade-off between reach and richness. Reach is simply about how many persons can be reached for communicating about products or services. TV ads reach a large population, however, the extent of the information that can be shared (richness) is limited. If richness was a priority, direct sales would be a better strategy. Richness is therefore about how much information, how customized, and how interactive the communication being

shared about a product or service can be. With physical channels, these were at odds and a trade-off was required. This trade-off was simply put out-of-play by online channels. Amazon offers a wide variety of products but at the same time, they offer product reviews, good quality service, ratings, and suggestions. The interaction between the company and its stakeholders (customers, suppliers, and partners) has also changed with digital technology. With social media, reach and richness are no longer dichotomies. The interactive web has transformed communication. Companies are using social network platforms, both internal and external, to increase the efficiency of a myriad of aspects such as R&D, customer preferences, sales tactics, and designs.

Digitalization is not a one-time thing or binary in the sense that one is digital or not. Rather many companies ranging from SME to large incumbents are at the beginning or middle of this journey. Even new companies that are built entirely on digital foundation, have to evolve on this journey. This journey can be divided into three main steps, each building upon the previous one. These are digitization, digitalization and digital transformation (see Fig. 1.5). Digitization means turning an analogue product or process to digital [6], for example filling forms by typing instead of writing by hand. Most companies have developed this capability by now. The next step is digitalization. Digitalization is used in various contexts and sometimes carrying different meanings. Generally, it means implementing digital technologies to change the processes and products [7]. It can also reshape the business model [8] by, for instance, implementing Internet of Things (IoT) solutions that change the way people interact with products and related processes or increase automation of processes [7]. Digital transformation is distinctively different from digitalization. Digitalization is on initiative (project) level while digital transformation is a strategic business transformation [7]. Digital transformation entails bringing about cross-organizational changes, implementation of various digital technologies, and acquiring new capabilities at the corporal level. The change is much than that of a digitalization initiative.

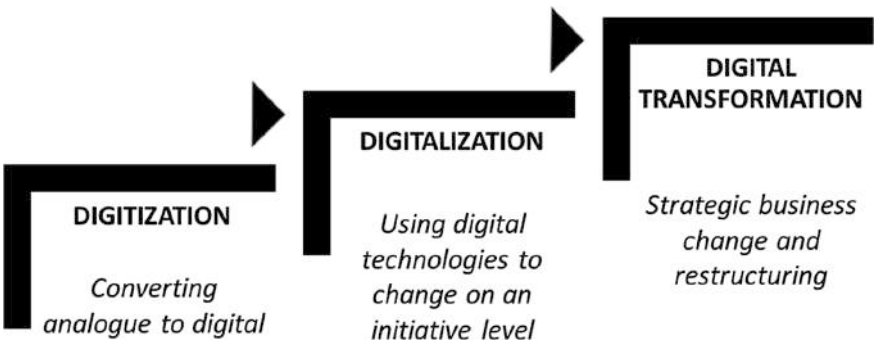

Fig. 1.5 Concepts of digitization, digitalization and digital transformation (based on [9])

1.3.2 The Digital Business Analyst

As can be seen, the digital era affects businesses at the level of their DNA, beginning from converting the analogue to digital and extending all the way to full transformation. For business analysts to be able to recommend solid solutions that can capitalize and be aligned with digitalization and its trends, they need to be well acquainted with how opportunities, needs, and problems can benefit from digitalization. For an analyst, each project offers an opportunity to bring the company a step further on the digital journey. Analysts should be able to identify such opportunities and not only help solve immediate problems, but also see ahead and propose solutions that will be beneficial in the overall context of digital changes. Digitalization influences the business analysis process as well, allowing for efficiencies but also new sets of required skills and competences.

E-collaboration is a topic that is of relevance for business analysis projects as well as day-to-day work at companies. Digital technologies have made global outsourcing of workforce affordable. A variety of tools have been developed to make collaboration experiences as productive as possible. The most beneficial tools for business analysts are email and instant chat for everyday communication, videoconferencing and screen sharing for interviews or workshops, and project management tools to synch calendars and provide stakeholders with access to the change initiative and its status. Online surveys can be used to gather requirements from a large number of employees and thereby set the analyst free from limitations of small samples of representative stakeholders.

During the current state analysis, the analyst should pay attention to overall business goals as well as digital goals. Many companies have developed digital strategies and every initiative should be aligned with such strategic aims. When analyzing specific business elements, such as processes or customer journeys, the analysis should support the findings with data. Process mining and data mining can provide new insights previously unknown and inaccessible. Data itself can be also studied to detect shortcomings in information flows. For example, CRISP-DM and data value chain give a generic framework to map data transformation and see if and how the data can be used to bring value to the company. When designing and developing the solution, tools such as prototyping or A/B testing can be used to improve quality. Such methods allow gathering constant feedback from many end-users and to identify issues before solutions are implemented.

Working with business analysis in a digital era, requires some basic digital skills. Most importantly, the analyst should be digitally literate, which means that he/she is able to access, evaluate, use, share, and create content using digital technology [10]. Analysts should be able to collect and process data in various programs. If a new program is encountered, the analyst should be able to pass the basic learning curve fairly quickly, know how to use forums, tutorials, wikis, and other sources to figure out the basics. The same applies to navigating between various devices and operating systems [11]. Digital technologies have made vast amounts of internal and external information available at our fingertips. The analysts should be able to

conduct productive research in a large pool of data [11]. The analyst should also be able to sense when enough data has been gathered to continue the work.

Business analysts do not have to be ICT professionals in terms of knowing how to write code or structure databases. However, analysts need to have a certain level of design and computational thinking [12]. This means knowing how systems work, what the key elements are, and terminology used by developers. The analyst does not have to build a system but has to bridge the communication between stakeholders with various backgrounds. It has become more common to use agile approaches in projects, especially if the projects involve digital aspects [13]. Therefore, it is important for the analyst to be skilled in agile tools and methods.

Overall, the analyst should continuously learn new skills to keep up with the pace of change. The business environment is constantly evolving, to which analysts have to match their skills and competencies. Perhaps the ability and flexibility to adapt, is the key competence required of analysts in the future.

1.4 Development of Business Analysis

Different organizations have reached various degrees of maturity in their adoption and implementation of business analysis. As the function of business analysis expands within a company, the value of such work is increasingly recognized, and business analysis is extended to broader areas of the business. In other words, business analysis is used in increasingly advanced ways and applied to strategic levels. To measure and assess the "maturity" of a company in business analysis, a framework called "Business Analysis Maturity Model" (BAMM) [1] can be used. The BAMM framework lays out the progression of business analysis within a company along two axes, scope (complexity of the work) and influence (degree of authority) given to the business analysts (see Fig. 1.6).

The first phase is defined as "system improvement" and refers to when business analysts are predominantly working with users to improve some aspect of their business systems (such as added functionality). In this capacity, the business analyst is primarily working with eliciting, analyzing, documenting, validating and managing requirements with the aid of various modeling techniques. The next stage is when the focus of the analyst is broadened to improve business processes. At this stage, the work of an analyst extends beyond the realm of information systems. At this level, analysis of various kinds such as strategy, stakeholder, problem, and gap analysis are performed. In addition, the analyst works with developing a business case and improves the processes. At the final stage of the progression, the business analyst operates more as an internal management consultant who assists senior management. In this capacity, the analyst focuses on portfolios of projects. You might see an overlap with the evolvement of the business analyst's profession as discussed previously.

Another way to describe the value and maturity of business analysis is the "Business Analysis Practice Maturity Model" (see Fig. 1.7). This model captures

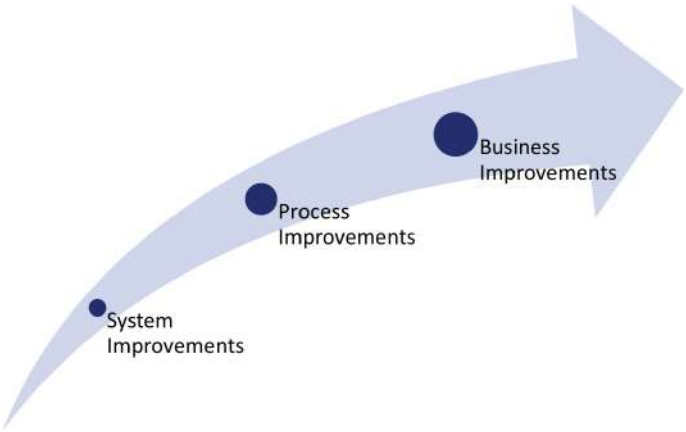

Fig. 1.6 Stages of the BAMM framework

the path of continuous improvement of business analysis practice within an organization. The first level is called "business analysis awareness." Business analysis takes place in the organization but lacks plans and structures for business analysis practice. At the second level, "business analysis framework", organizations recognize the value of the business analyst. Usually, there is a centralized unit responsible for managing the business analysis framework. At this level, the business analysis practice is predominantly project focused. As such, analysts are working mostly with various aspects of requirements (corresponding to the system improvement of BAMM). The third level, "business alignment" has an enterprise focus. The organization has reached a level where the business analyst ensures alignment between business strategy and project goals. The analysts work with enterprise analysis, portfolio management, business case development, and benefits management. At the fourth level, "business/technology optimization" business analysis is well integrated with other similar functions such as project management and quality assurance. Here, there is a "competitive focus" as the work of an analyst aims at improving the competitiveness of the company. At this level, opportunities are actively realized into innovative business solutions, business analysts are involved in aspects of strategy development and long-term planning.

The maturity level also reflects the evolving role of an analyst. A new business analyst might begin with focusing on working with requirements. However, as the analysts gain experience and become more skillful, they move a step up and are involved in projects of higher complexity. At such levels, they might work with improvements that affect and involve several divisions of an organization. As the analysts evolve, they might be involved in managing portfolios of improvements determining which will yield the best value and is most aligned with the strategic objectives of the organization. Perhaps the analyst will also work with finding new opportunities that improve the position of the organization in the market.

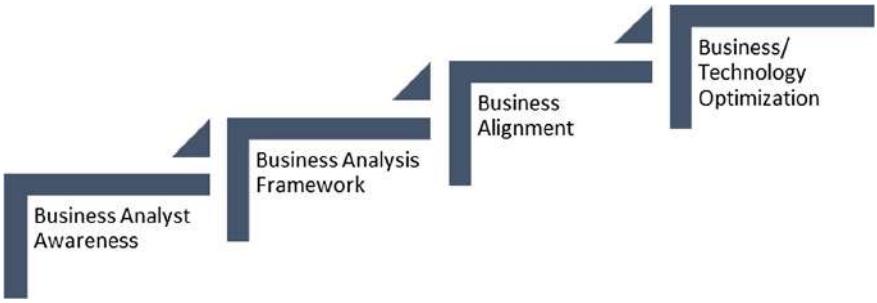

Fig. 1.7 Levels of the business analysis practice maturity model

1.5 The Business Analyst

1.5.1 The Role of a Business Analyst

A business analyst is someone who is responsible for discovering, synthesizing, and analyzing information from a variety of sources within an enterprise "for the purpose of eliciting the actual needs of stakeholders in order to determine underlying issues and causes and ensure that the designed and delivered solutions are aligned with the needs of the stakeholder" [3]. This role is also defined as an "advisory role which has the responsibility for investigating and analyzing business situations, identifying and evaluating options for improving business systems, elaborating and defining requirements, and ensuring the effective implementation and use of information systems in line with the needs of the business" [1].

As can be seen from the definitions above, the role of the business analyst is about understanding and identifying problems to ensure the development of effective solutions that address the right problem and satisfy the real needs. In other words, a business analyst is someone who works with "enabling change in an enterprise by defining needs and recommending solutions that deliver value to stakeholders" [3]. The business analyst applies a set of techniques to achieve results or performs a set of core activities to ensure that the right problem is resolved with the appropriate solutions.

The tasks performed are not restricted to business analysis alone. As was mentioned earlier, other professions perform similar tasks, resulting in an overlap. A business analyst works with eliciting requirements as does a software product manager. A business analyst can model business processes as does a process analyst. Business analysis is therefore not something performed exclusively by business analysts. Rather, anyone performing tasks that fall within the definition of business analysis is at least partly a business analyst regardless of their job title.

Over the years, the role of a business analyst has evolved and now incorporates a multitude of perspectives that he or she is required to perform. These are as follows [14]:

- **Analyst** – the analyst is the ultimate problem solver that analyzes problems, "considers issues from a systems perspective; systematically organizes the problem, opportunity, or situation; sets priorities; identifies causal or if then relationships and synthesizes the problem's component parts in the systems context."
- **Facilitator** – the analyst is a "key facilitator within an organization" who effectively elicits requirements by ensuring "positive, continuous discussion and progress." They "create a positive and constructive group environment, maintain a group's focus, lead a discussion toward stated goals, and use questioning techniques and other tools to discover user and stakeholder processes and gather data."
- **Negotiator** – the analyst mediates between clients, stakeholders, and other involved parties. They build consensus and agreement and address contentious issues.
- **Architect** – the analyst works with solutions that include systems development, process improvement, and organizational change. They model data, business processes, use different designs, consider usability and understand the needs of the end users.
- **Planner** – the analyst plans and manages activities that secure successful results within constraints. They ensure that requirements are "accurately identified, captured, and tracked throughout the project's life cycle; define, organize, and schedule requirements management activities in a way that's consistent with the organization's culture and standards; and execute planned requirements of management activities while remaining flexible to changing requirements and project deadlines."
- **Communicator** – the analyst has a role as a communicator between stakeholders' needs and project organizations. They "use discussion, conversations, and interviews to further understanding; speak clearly and listen actively; and create clear, complete, and usable documentation."
- **Diplomat** – the analyst ensures satisfaction with the solution. They build and maintain positive working relationships with customers throughout the process and are sensitive to priorities, goals, and competitive advantage.
- **Expert** – the analyst applies his or her expertise to find solutions. They need to understand the business models, industry, and other relevant aspects.
- **Strategist** – the analyst thinks "outside the box" and considers long term aspects that extend beyond a specific project. They understand visions, goals, and strategies to reach business goals and translate them into practical plans aligned with the company's context.

The role is not to determine and decide on all aspects such as what the problems are or which solution to choose. Rather the analyst acts as a "navigator" to ensure that the right problems have been identified and that the solutions are relevant. The

role of an analyst is to ensure that all options are identified rather than pushing for a particular solution based on preferences. Naturally, the analysts can contribute with much valuable input but their role of facilitating collaboration, creating a common understanding among the stakeholders, analyzed, evaluating and examining situations, solutions, and requirements are also of vital importance.

It is important to remember that the analyst role will vary during the business analysis process. In the initial phases, the analyst has an important role of gathering data and analyzing the situation to uncover the real problems or needs. However, during the analysis of needs and evolution of alternatives, the role might be more geared towards "negotiation and meditating" while during the delivery of the solution phase, the role is mainly supportive and ensuring that changes are compliant with the business needs.

Finally, the role of the analyst will be different depending on seniority and specialization. Someone with a business background might begin work by eliciting requirements for smaller projects, perhaps under the supervision of a more experienced analyst. Such a person would be considered as a junior business analyst. After three or more years, that analyst would perhaps begin working on larger change initiatives and be active in planning and setting up new initiatives. Having gained experience with such work, the analyst might be ready to take the role of lead analyst on larger and more complex initiative. Such a business analyst might also work with initiating change initiatives and supporting junior business analysts. After ten or so years of experience, the analyst is ready to work with strategic planning, assessing and managing portfolios of change initiatives rather than participating in specific ones. As can be seen, the role of the analyst will change as experience is accumulated (Fig. 1.8).

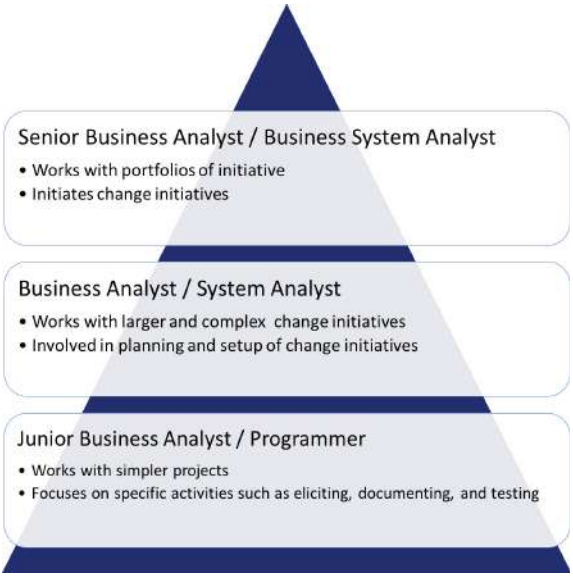

Fig. 1.8 Business analysis role and seniority

A similar path of career development might arise for someone who has roots in IT. In such cases, they begin as a programmer or junior analyst, progress to system analyst and business system analyst and finally be more involved in strategic management.

1.5.2 The Competencies of a Business Analyst

The work of a business analyst requires a set of competencies and skills. It might feel like superhuman capabilities are required. In reality, it is much simpler than that. It is a process by which capacities and skills mature with experience and new ones are learned. Business analysts, in particular at more senior levels, work as "generalist" rather than "specialist." In this regard, competencies and skills in analytical thinking, learning, conceptual and creative thinking, decision making, organization and time management, communication and interaction skills, and facilitation are highly valuable.

A major part of the work conducted is analysis or preparatory work for analysis. In fact, as an analyst, the core work is to gather and analyze information for the purpose of solving a problem. This includes being able to assimilate information from different sources, being able to identify which information is relevant, valuable and applicable or useful after being adapted. The analyst must then use all these findings to create and modify a gradually crystallizing solution. It follows quite naturally that the combined skills of analytical thinking and problems solving are essential. The competencies of analytical thinking and problem solving are expressed in the ability to learn and absorb information. It also concerns conceptual, visual, and creative thinking. Furthermore, it encompasses the ability to solve problems and take decisions.

Learning concerns the ability to take in different kinds of information from various sources, learn what information is directly relevant, and if it can be useful by modifying or adapting it to the current context. This ability is particularly valuable as the advancements in business development and technology are being made rapidly and the environment is constantly evolving. An analyst will initially need to gather raw data and quickly form an understanding of what is relevant and learn what is being presented in the data. Following this, the analyst needs to understand the contents of the gathered material and gradually apply what has been learned in practice. Finally, the analyst has to analyze and evaluate the experiences gathered and draw conclusions. Considering that the amount of available data is immense and growing, the ability to learn quickly is a great advantage. For a digital business analyst, learning and being curious of how digital technologies can deliver value is key. The pace by which new digital technologies are introduced, developed, refined, and scaled up is impressive. The analysts will never be fully trained in this field and as soon as they master one technology, another emerges. As such, the curiosity and willingness to constantly learn and update one's own knowledge of digital technologies is crucial.

The analyst is likely to be swimming in a sea of data that provides detailed and perhaps contradictory information. Applying the ability to conceptualize, allows for discerning the importance and relevancy of information gathered, and understanding how the different pieces fit into the larger picture. The situations being analyzed are seldom simple or contained. It is therefore not sufficient to make fragmented analysis. Oftentimes the analyst is dealing with complex situations where people, processes and technologies interact and are intertwined. This requires one to understand and analyze how a change affects other parts of the whole system. As such, the ability of thinking, analyzing and working in a conceptual and holistic manner is crucial.

It is not enough for the analyst to understand the context. A business analyst will need to communicate the complexity in a manner that is easily understood, creates a common understanding, and allows for meaningful discussions. The analyst, therefore, will require the ability to visually capture complex situations and with the aid of graphical representations, facilitate communication, and generate common understanding. Good graphical representations will also aid the stakeholders to contribute with valuable inputs and perspectives as they see connections more easily and understand other stakeholders' contexts as well. As such, the ability to visualize complex and integrated non-visual information is an important competence of the business analyst.

Creative thinking is primarily the ability to generate new ideas, concepts, and to make new or different connections between different parts of a context. In solving problems, it is important to have the ability to depart from conventional thinking and how things were done in the past. The business analyst does not only need to apply creative thinking but also encourage and stimulate such thoughts in others. When situations and solutions are discussed in a creative atmosphere, existing conventional ideas and ways are questioned, new ideas are explored, and the group builds a healthy atmosphere for structured and task-oriented dissonance. It is in such environments that new solutions and lines of thought are conceived. It is, therefore, a valuable ability of the analyst to stimulate and foster such an environment in the group meetings.

In the business analysis process, there are many steps where decisions need to be taken. Naturally, decisions based on data are better than hasty decisions that later must be modified. An analyst must know when enough data is at hand, when stakeholders are ready, and when relevant criteria are fulfilled for taking a decision. Decision making might require negotiating and managing trade-offs between stakeholders or compromises in regard to the different parts of a specific solution. Consider an example when a larger change is to be implemented. The line manager is nervous and does not feel comfortable taking a decision and approving the implementation. In such cases, the analyst can take a pro-active role and discuss what criteria needs to be fulfilled (such as what tests and results need to be shown) for the line manager to be comfortable with the implementation. Even after such tests have been conducted and the results are satisfactory, the line manager might be skeptical. The analyst can call a meeting with the line manager and other senior managers where he can present the results to get a collective decision for

implementation. The analyst has in essence relieved the line manager of a heavy burden and found a way to proceed with the project.

A business analyst will engage in many different types of meetings and will need to manage quite complex plans to ensure that needed steps and activities are conducted. At the same time, any plan made will most likely be changed and such changes can push the timeline in undesirable directions if not managed effectively. As such, the ability to manage time, rescheduling, prioritizing tasks, ensuring key persons are present and to meet deadlines are valuable skills. When an analyst masters the skill of organization and time management, deadlines are met in a timely manner, estimated work effort is achievable, stakeholders are informed about when and where they need to be, meetings are prepared, the right persons are attending, the contents of the meetings are documented in a structured manner and distributed to all relevant stakeholders, and status of the work that is to be performed by various parties is up to date.

An analyst will be engaged in communication with a variety of different stakeholders. Most commonly they will come from different backgrounds, have a different set of skills, and be knowledgeable in different aspects of the company's structure and processes. The analyst needs to be effective in extracting facts and insights and share different aspects of the situation with all stakeholders. Furthermore, this sharing must be in a manner that is understandable and useful for furthering the knowledge base about the problem. Such tasks require strong communicative skills. The analyst will, therefore, communicate verbally or non-verbally, with the use of models or in writing. In addition, it is essential to be a good listener. Most of the information gathered will come from other people, and to correctly understand the information and meaning in the context of the current problem, requires listening skills.

A business analyst will be required to organize and facilitate meetings and workshops. The main source of information comes from such meetings and as such, they are vital to the work of an analyst. Moderating at meetings and workshops, eliciting facts, perspectives and reaching agreements on common grounds are therefore important. As a facilitator, one does not take sides but remains as a third party to the discussions. The analyst remains neutral, encourages all views to be presented, building upon gathered information, ensuring that participants are correctly understanding each other, is attuned to the different interests and objectives of the participants, keeps the discussions on the right track, and prevents them from being sidetracked.

The process of business analysis requires a large portion of teamwork and collaboration with another analyst, subject matter experts, and stakeholders. The ability to work efficiently in a team, to be able to manage differences in opinions, perspectives and objectives is vital to keeping the work progressing. As different participants bring their specific competence and area of knowledge, the analyst will also be "teaching" others. A manager from the operations might not be well versed in information technology, or the IT expert does not understand how the business operates. The ability of the analyst to explain or inform the business about IT and vice versa at the level of detail required, is directly related to how well the team understands the situations.

1.5.3 Business Knowledge

The above competencies and skills are applicable in virtually all aspects of business analysis. In addition, there are two areas of knowledge that might prove indispensable for analysts. By keeping up with these fields, the analyst will have an edge and hopefully excel at the job. These are "business knowledge" and "tools and techniques".

Previously we touched upon the fact that most projects will exist within a context and most likely be influenced by its external and internal context. As the context matters, it is important that the analyst is aware of the business knowledge. Business knowledge refers to the understanding of the different areas in the context of a specific project. We will discuss these areas later, but this knowledge is one of the competencies an analyst should be aware of. Business knowledge can be divided into two sub-categories – external and internal.

1.5.3.1 External Business Knowledge

External business knowledge refers to general but relevant knowledge about the domain of the business. The knowledge should be outside of the organization and as such, common to all competitors. Such external knowledge has an important bearing on the analysis and the solutions. For instance, when an analyst is tasked with solving a problem, it is very likely that similar problems have been solved before. An analyst working to solve a problem within the domain of supply chain management, will greatly benefit from the accumulated knowledge gained from other similar projects, both within the same and from other industries. Another example is using specific technologies. An analyst can help the company reduce the risk of repeating common mistakes if they are aware of how such technologies have been implemented in similar or different contexts. There are consultancy firms specializing in specific types of solutions and issue "best practices", reports, and case studies targeting similar solutions across industries.

Another competence within external business knowledge is industry knowledge. It is similar to business acumen but focuses on knowledge about a specific industry. An analyst solving a problem for a hotel chain needs to be updated on the major players and competitors, current practices, trends, key processes, industry-specific terminology, and regulations in the hotel industry. Such industry knowledge includes keeping up with different analysis and trend reports in order to follow developments. Knowledge about the industry domain allows for better analysis and ensures that solutions are in line with the developments of the industry. If an analyst has permanent employment within a company, it is vital that they are kept up to date with industry knowledge. However, if an analyst works as a consultant or starts to work within a new domain, he or she should make every effort to become acquainted with the basics of the industry. Lacking such knowledge or failing to seek it when required, can lead to sub-optimal solutions. Problems or needs exist

within a context and the context (environment) changes. Solutions need to be in place for long periods and it would be a waste of resources if solutions were built that become outdated within a few years. As part of good analysis, solutions recommended should have considered the relevant aspects of industry knowledge to increase the probability of the solution remaining relevant for as long as possible.

The role of the business analyst was initially as a communicator or link between business and IT. Although the role of a business analyst has grown, the role of being a link between business and IT still remains. Effective "linking" requires that the analyst has a foundational understanding of information systems. This is particularly important as almost all improvements involve information systems to some extent. For these reasons, it is an important competency to understand how information systems work and what their main components are, to have familiarity with system development processes, and the contexts in which they are most valuable. It is important for a good analyst to possess an awareness of the capabilities of information systems. Similarly, it is useful to follow trends of how information systems can solve problems in more efficient ways, such as incorporating big data, software as a service, and mobile technologies. We have discussed digitalization and it can enable value creation. Almost all solutions generated these days should have considered whether digitalization can add additional value or design the solution in such manner that it can be extended for digitalization in the coming years. At the very least, digitalization should be discussed and assessed for if it is relevant for a solution or not. The analysts will find it difficult to effectively lead and influence such discourse if they are unaware of the trends and capabilities of digitalization.

1.5.3.2 Internal Business Knowledge

Internal business knowledge concerns knowledge about the company in which the analyst is either an employee or consultant. It is knowledge about how internal aspects of how the company is structured and how it achieves its purpose. It covers an understanding of the business model, strategy of the company, organizational knowledge, and knowledge of the standards used.

All firms have a business model comprised of different components that work together to produce products or services for consumers. Competing companies can have similar products but different business models. For instance, a retail bank and a private banking company offer financial services ranging from bank accounts to equity trading. However, their business models and strategies differ significantly. The retail bank focuses on economies of scale (high volumes) and might have cost efficiency as one of its main strategies. On the other hand, a private banking company targets wealthy families and offers customer relationship of the highest quality. Although these companies offer more or less the same set of products, their business models and strategies differ significantly. In fact, they are not even considered as competitors. In other words, internal business knowledge is about gaining an understanding of how the company has organized itself for the purpose of achieving its goals. Such internal knowledge might prove to be very important in determining

which solution to choose when addressing a need or solving a problem. The alternative solutions need not only to solve the problem but also be aligned with the overall model and strategies of the company. In failing to do so, the chosen solution might work against the company rather than enable delivery of value. Consider the example given above. If a retail bank and a private bank have the exact same problem, given their different business models, it is likely that the solutions will differ. In the case of the retail bank the solution needs to accommodate large volumes, as the customer base is large, rely on higher degrees of standardization and automation. On the other hand, for the private bank, customization might be of more importance as volumes are lower and customer relationships much more important.

Every organization has its own internal structures in regard to business units, departments, key persons at each unit, the relative power of influence of stakeholders, formal and informal communication channels. An understanding of the organization allows the analyst to be more effective. For instance, if an improvement project spans over several business units, it will be very helpful to know who to talk to in different departments. It might not be the head of the department who is the best person to approach. Sometimes, someone else has better understanding of the operations of that division and informal decision power. Knowledge about who are the experts on different subjects can significantly assist in both understanding the problems and gaining support for solutions. Furthermore, many organizations have their own terminology such as specific abbreviations or names for certain roles. Knowing about these terms and what they refer to makes the work of the analyst easier.

Most improvements require some form of change that needs to be accepted by key persons in different positions. Getting the support from the "right" person is important. Consider the following example. A support division such as the back office of a company is investigating an improvement that will achieve better reporting. However, as it is a support organization they might have to fund such an initiative by increasing their internal price to the front office. If the front office manager is not willing to accept a higher price or pay for the investment, the project will fail before it even starts. Knowing about the funding policies and structures of a company, which managers can take decisions on financial aspects of investments, and the amount they are authorized to decide on, can aid the analysis work. Organizational knowledge encompasses understanding about the methodologies the company has chosen as the standard method, for instance, when developing information systems. The employees have used these methodologies and are acquainted and comfortable with them. The business analyst cannot disregard or be uninformed about these methodologies but needs to understand how to use them to produce better results.

1.5.4 Tools, Technology, and Adaptability

An analyst who can adapt to the context will be more successful. The competence of adaptability refers to being able to use different techniques, methods, and

approaches in order to complete tasks in the most efficient ways. Stakeholders might require a certain method of doing some tasks. Perhaps the involved parties might be more knowledgeable or comfortable with certain techniques. If an analyst is facilitating a workshop and notices that the meeting is not progressing satisfactorily, it is necessary to determine what the obstacle is, and find ways around it. Perhaps the same results can be achieved with a different technique or method. The analyst must be able to adapt and use different methods to achieve the objectives. If the analyst persists in using the same methods, it can cause unnecessary obstacles in the path of reaching the objectives. Furthermore, existing methods are perfected and new techniques are introduced that could be better suited for the purpose of being more efficient.

During the business analysis process, some unexpected aspects will occur that can affect the complexity. To this end, it is necessary to adapt. It might be adapting the scheduling, the meeting, or even the scope of the initiative due to changes stakeholders may require, new information emerging, or an investigation unveiling additional aspects not previously considered. The analyst must possess the ability to adapt to changing conditions, be able to consider different perspectives, to change views when required, and must be able to operate during moments of unclear conditions, accumulate experiences by adding more tools to the toolbox, and evaluate for the purpose of improvement.

Chapter 2
External Business Context

Business analysis is conducted at different levels (sometimes called horizons). Simplified, the horizons can be divided into three where the highest is strategic, followed by initiative and finally the delivery horizon (see Fig. 2.1) [15]. While the same fundamental principles of business analysis apply, the actual work varies depending on the "horizon." At the highest level (strategy), business analysis is mainly concerned with deciding which change initiative to prioritize. On the "initiative" level, the change initiative has been chosen and the analysis is focused on it. Once this has been done, the "delivery" level goes into the details to realize the solution.

At the strategy level, a senior business analyst assesses the need for different change initiatives by adding new, modifying or cancelling existing initiatives. These decisions are influenced more by what is happening in the external environment such as evolving or changing markets, trends, and technologies. The analyst is more engaged in potential influential factors stemming from the external context. Alongside the external context, the analyst needs to consider the internal context as well. The management of change initiatives requires awareness, analysis, and alignment with the organization's business strategy, goals, objectives, business model, and capabilities. However, while such external and internal contextual factors might have an influence at the initiative level, they are not crucial parameters in the analysis work. Rather, the focus is shifted to identifying the real problem or need, analyzing the current state, and finding alternative ways of solving the problems. As such, the degree of detail increases, and the type of input considered for analysis is different. Finally, at the level of delivering the solution, the analysis work is focused on one solution that is designed, detailed, developed, tested, and finally deployed.

Although external and internal context is primarily useful at the strategy level, it has value to the initiative level as well. When developing a new product, it is relevant to consider, for instance, what features competitors offer and the trends to which channels consumers are moving towards. The internal context might become relevant in choosing the most suitable solution by, for instance, exploiting existing

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Fig. 2.1 Levels of horizons in business analysis

strong capabilities within the organization. When the delivery level is reached, the influence and relevancy of the external and internal context falls to a minimum.

In this chapter, aspects relevant to the strategy level are discussed. These aspects include the external (aspects that reside outside an organization) and internal aspects (within the boundaries of an organizational context). The senior business analysts use these inputs in managing a collection of change initiatives. As such, portfolio management is also discussed. Larger companies define and standardize how decisions are taken regarding the different aspects of projects. Some might even define how information is to be stored for re-use. Companies will also assess and monitor the development of business analysis so as to ensure continuous improvement. These aspects will also be discussed in this chapter as they concern all change initiatives rather than being unique to one initiative.

2.1 Business Strategy

The term strategy is often used but its definition is more elusive. Although most people have an understanding of what it means, it is more difficult to clearly define it. Kenneth Andrews defined strategy as "the pattern of decisions in a company that determines and reveals its objectives, purposes, or goals, produces the principal policies and plans for achieving those goals, and defines the range of business the company is to pursue, the kind of economic and human organization it intends to be, and the nature of the economic and non-economic contribution it intends to make to its shareholders, employees, customers, and communities." [16] Another definition of strategy states that it is "the direction and scope of an organization over the long term, which achieves advantage in a changing environment through its configuration of resources and competences with the aim of fulfilling stakeholder expectations." [17]

If we break down the different definitions to their core components, we find that they often include the following parts:

- The objectives, purposes or goals of an organization (what they want to achieve).
- The plans and policies the organization has to achieve its objectives (how they intend to achieve their objectives).
- The business/markets in which the organization is going to be engaged (where it wants to be active such as global or local markets, financial services or high-tech equipment manufacturer).
- The contributions (financial and non-financial) it aims at making for its various stakeholders (for whom does it intend to bring what value).

At the core of this definition and most other viable definitions, we will find strategy being the way in which an organization seeks to achieve its objectives in its domain of operation (industry). The strategy can be different and take on many different shapes. Mintzberg [18] provided five different definitions of strategy that illustrates this variety. According to Mintzberg [18] strategy can be a:

- Plan – a set of consciously chosen actions or guidelines to manage different situations where the strategy is both developed consciously and purposefully.
- Ploy – a specific maneuver to outsmart or outwit a competitor.
- Pattern – a set of actions that have emerged as a pattern of behavior for the organization (not necessarily consciously or purposefully).
- Position – a marking of a territory in the market that is held so strong that others are discouraged from taking.
- Perspective – a perspective that over time becomes the ingrained way of how the organization perceives, understands and interacts with its environment.

All of the above aspects are in themselves definitions of strategy or a way of understanding the strategy an organization adopts, in order to gain, secure and maintain its position in the marketplace.

2.1.1 The Evolution of Business Strategy

Historically there has been a strong similarity between how corporate people discussed strategy and how it is likened to the discourse on warfare strategy. Business strategy can be said to have emerged from the most general view of strategy. It is not clear when it was acknowledged as a subject in its own right, but some argue it was born in the 1960s.

Initially, corporate strategic planning corporates aimed at creating a "master plan" that was developed and then simply executed. These ideas worked on the assumption that the business environment was stable and long-term plans could be easily implemented. Consultants were heavily involved in guiding the strategic planning of companies by applying checklists. In short, the process consisted of the following steps:

1. Strategy Formulation – setting the objectives of the organization (preferably numerical ones).
2. Evaluation – assessing the internal and external conditions of the organization. It should be noted that this step was conducted in a very procedural manner by following pre-defined steps.
3. Selection – comparing the different strategies by using different metrics for measuring returns and risk.
4. Implementation – translating to the operational level by decomposing the strategy into actionable activities for short, medium and long term.

At the end of the strategy formulation process, a "master plan" had been created that had to be executed. This process was used extensively but was problematic. Firstly, these strategic planning processes were predominantly conducted by elite groups in organizations and as such, few outside of these groups were aware of the objectives or were even invited to share their perspectives. Furthermore, the process became more important than the content as they rigidly followed the "process". The strategic planning was conducted at the higher levels of management, which created a dissonance with the operational management who in the end were supposed to implement these plans. This approach failed to consider the culture of the organization or allow for any flexibility. Companies started abandoning such approaches to strategic planning at the beginning of the 1980s. Gradually strategic planning started to focus more on the external environment such as market structures. History has taught us that strategies and approaches to strategic planning that focus too much on pre-planning based on assumptions of markets being certain and constant, are problematic. Rather adopting a dynamic process where we learn and make adjustments as we progress, is more effective. Another lesson is that strategic planning does not only concern top management or an elite group of planners but rather all levels of the organization.

Although the main approach of strategic planning has changed, some of the models developed in the past 50 years are still used today. They do have merit when used as complementary methods but not when they become the only method. For a digital business analyst, it is vital to adapt such methods to the digital context. By knowing about such methods, the digital analyst can use them, in adapted and often reduced forms, to serve his or her purposes. In the following chapters, we will introduce some of the most common and well-known models used to analyze the external and internal environment and the business strategy of an organization.

2.2 Business Context

The problem/need/opportunity that the analyst is analyzing exists within an immediate context (see Fig. 2.2). At this level, there are technologies/information systems, business processes, data, and resources that are used in the current state. It is within this immediate context that the problems occur. However, these aspects

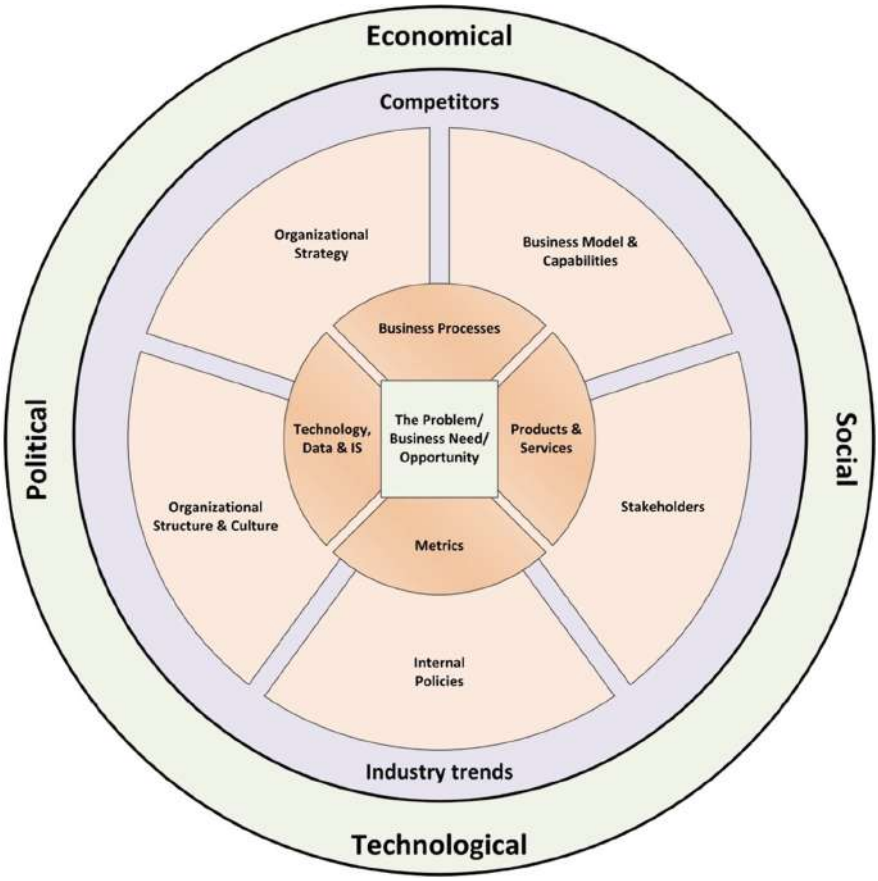

Fig. 2.2 Business context

exist within another context, that of the organization. The organization will have certain organizational strategies, business model, stakeholders, internal policies, and organizational structures and culture that in various degrees influence the immediate context of the issue being investigated. The organization itself exists within the context of its competitors and trends in their industry. Likewise, the competitors all operate within the context of their environment influenced by political, economic, social, technological influences and changes. Therefore, the external and the internal context, within which the problem or the needs exist, can have an influence on which alternative is the "best" or the "right" solution. As such, it is important to know the context within which a problem is to be solved. If an analyst is an employee of the company, they are probably aware of the business context. If that is not the case, it is helpful to understand the context by analyzing the business model of the company and the strategy they employ to gain or maintain their competitive advantage.

The business context can be analyzed by beginning with the environment and gradually working towards the core (the change initiative). A way to start would be to get better acquainted with the external context (existing outside the boundaries of the organization). Next is the competitive stage and industry trends, which concludes the external context analysis. The next layer is now within the organization but at a higher level. These factors may or may not be relevant to the issue at hand. Oftentimes, some aspects are more relevant while others are insignificant. For instance, internal policies on how projects are set up and funded might be very relevant for larger projects. On the other hand, if the project concerns developing a mobile app as a portal for an existing service, it is less relevant. The influence is general and acts as guiding principles. At the core of the issue, it is no longer influences but actual aspects of the change initiative. Here, we leave context analysis and focus on the change initiative:

1. The internal context analysis – context within the boundaries of the organization but outside of the scope of the issue – aims at getting a solid grasp of the following aspects:
2. Analysis of the strategy the company has chosen to gain or maintain its competitive advantage in the marketplace.
3. The business model the company has developed usually depicted as a model (canvas) that shows how they created and delivered value to their customers in a profitable way.
4. Internal policies, guidelines, and templates put in place to increase efficiency by incorporating past experiences in their future work.

The context matters indirectly as it provides a framework for evaluating and determining the importance of different aspects of a problem and selecting solutions. Some companies have chosen a low-cost strategy to deliver products. For such companies, cost cutting and efficiency improving initiatives are the priority. All projects are influenced by this goal. This affects how a problem is analyzed (focusing on its costs over quality or variability) in terms of efficiency. Similarly, solutions that give the best efficiency gain, and cost the least are more attractive than others. Another example is internal policies. If the internal policy stipulates usage of specific methods for eliciting and managing requirements, the employees will know those methods better, documentation following these methods is better understood by others and there might even be templates, help guides and examples of how to use these methods. In such situations, the business analyst is more or less forced to apply such methods.

2.3 External Context Analysis

An organization operates within an environment that is affecting it. It might be larger trends and influences that affect all organizations but in different ways or it might be more specific to an industry. Growth in an economy fueled by decreased

interest rates affects all organizations. However, new safety regulations for transportation of animals or a price change in meat prices predominantly affect certain industries. There are many factors in the external environment and it is impossible to consider them all. For this reason, part of the analysis work is to "find" the factors that are relevant to the organization or the problem and its solution.

The external environment is relevant as it might influence the solution. For instance, failing to consider key trends, can leave an organization unprepared for changes and ultimately in a weaker position to effectively compete. The external analysis is predominantly about the environment and the analysis of the industry in which the organization is active. Below we introduce the most common methods for such analysis. The first one is called PEST analysis and considers the macro level, that is, factors influencing all organizations. The second one, the five forces analysis, focuses on the players and characteristics of an industry. Finally, we will briefly discuss trend analysis as well.

2.3.1 PEST Analysis

PEST analysis [19] provides a structured way of analyzing the external environment of the organization by looking at four sources of changes that affect an organization. These are Political, Economic, Social and Technological (PEST).

Political: Political factors that can lead to changes that affect an organization. It could be regulations for an industry such as all Euro transfers within the EU must not cost more than domestic transfers. Another example might be elections or discourses regarding certain policy issues such as tax increases, deductions, and tariffs.

Economic: Economic factors can be, for instance, the unemployment rate, the current economic growth or decline in a country or region, market growth, foreign exchange rates. These economic factors affect a company in regard to availability of resources, costs, profitability, and attractiveness to enter new markets.

Social: Social factors concern the socio-economic environment such as demographics of the population, lifestyle attitudes, sentiments or education. The change in population growth or the age distribution is highly relevant for a company managing pension funds. Other examples are the levels of health, education, mobility, and attitudes. Changes in such factors can have an effect on the customer base and have a long-term effect on the company.

Technological: Technological factors refer to both the positive and negative impact of advances in technology. These factors can be new technologies or the penetration of a specific technology. A company that is attuned to the technological changes can use the emerging technology to improve their profitability.

The main idea of a PEST analysis is to identify emerging opportunities or give advance warnings of significant threats. Such awareness allows for taking actions to either use the potential that lies ahead or divert threats. The PEST analysis can be carried out in workshops or brainstorming sessions. Each identified factor that is

outside the sphere of influence of the organization, and will have some level of impact, should be discussed. Note that they need to be factors that are external influences that can impact the organization. Once lists of relevant factors and how they impact the organization are identified, they can be prioritized, and the most relevant ones can result in some kind of action by the organization.

It might be helpful to think of the following questions when conducting a PEST analysis:

1. What is relevant to the organization or the problem area at hand? Note that the PEST analysis is done for a specific purpose. For instance, if an organization is considering a change of strategy, the relevant aspects will be geared more towards the enterprise level. However, if it is a specific problem, only those aspects that relate to the problem are relevant. Consider a university that wishes to introduce an automated plagiarism system. If a PEST analysis is conducted, it is not meaningful to consider relevancy in regard to the university as an organization. Such an analysis, although interesting, will most likely not contribute anything valuable to the issue of a plagiarism system. However, when considering the "S" (social), the sentiments and shifts in attitudes towards "cheating" by future students is likely to be very relevant. Furthermore, when considering "T" (technology), the emergence or usage of online services that provide students with finished homework could be very relevant.
2. What is likely to happen? During the PEST analysis, many things might be identified but it is important to assess their likelihood. At the end of the analysis, we want to focus on relevant and likely factors.
3. What trends are emerging? One can normally recognize new trends which might become important factors within 3–5 years. It is good to consider such trends because they will be more likely (as they are beginning to have an impact) and they are more talked about leaving less room for speculation as to their impact. New trends can be discerned by looking at major trends and also, looking at what experts in the field are talking about and what they are forecasting.
4. What do these identified likely factors mean for the organization/the problem and solution? How can these factors impact or influence the organization/the problem and solution? The main objective of the PEST analysis exactly fulfills this role, what it means for us, i.e., how can these influences impact the organization or the problem/solution. Being aware of this allows for better solutions and to be better prepared to manage it when it becomes a reality.

It is important to conduct the PEST analysis based as much as possible on data. Some degree of speculation and interpretation is unavoidable, but the foundation should be as solid as possible. There are some variations to PEST such as PESTEL. At the core, they are all the same. All variations of PEST cover the political, economic, social and technological factors. The difference is that other versions include other factors such as environmental (or ecological) and legal factors (PESTEL).

2.3.2 Porter's Five Forces Analysis

The five forces analysis [20] also examines the business environment but is confined to the business environment or the industry in which an organization is active. Understanding the structure and dynamics of an industry is important for strategic analysis as it has bearing on the potential profitability of that industry. Porter's five forces analysis is a tool that facilitates analysis of the five competitive forces that can either be helpful or an obstacle to profitability in an industry.

The five forces framework is a way to assess the attractiveness of an industry. In other words, if you wanted to start a business within an industry, how easy or difficult would it be? Therefore, it is more often used for strategic analysis rather than for solving particular problems within an organization. As such, it might not always be straightforward to use it for business analysis. However, as a business analyst might encounter problems of a more strategic nature, it is valuable to be acquainted with the five forces framework. Furthermore, it is good for analysts to have a tool for understanding the dynamics of the industry in which they are working to solve problems. Although it might not be directly relevant, it can constitute "background knowledge" that enhances the understanding of the context of the problem or issue being analyzed. Finally, one of the competencies of analysts is awareness and basic knowledge of the industry in which they work, and the five forces analysis is one way to gain such a basis. The five forces are as follows:

As can be seen from the Fig. 2.3, Porter considers the degree of competitiveness of an industry being dependent on five forces. At the core is the "intensity of rivalry", which in turn has an interplay with "threat of new entrants", "threat of substitute products or services", "bargaining power of customers", and "bargaining power of suppliers". Each of these factors has threats and advantages for an organization. Below we discuss these components.

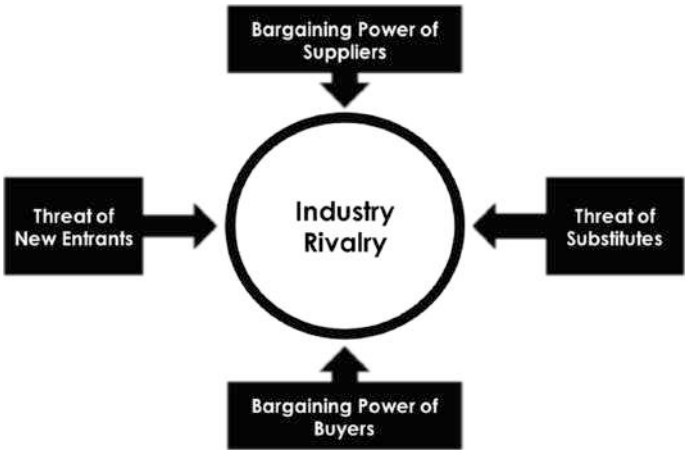

Fig. 2.3 Porter's five forces

2.3.2.1 Intensity of Rivalry

The intensity of rivalry refers to the intensity with which a company is competing with its direct rivals or competitors. Let us consider Coca-Cola and Pepsi. They are intensively competing against each other. However, the rivalry does not refer to how intensely the two companies compete against each other. In fact, both Coca-Cola and Pepsi have their share of the market and it can be said that intensity of rivalry is low. On the other hand, the market share of both Coca-Cola and Pepsi will decrease if new companies enter the market. As such, the potential profitability decreases. The more companies competing in a market the higher the intensity of the rivalry.

If the incentives to compete in an industry are lower, the intensity of rivalry will be lower. For instance, if the industry is growing strongly, there is less incentive for competition because the incumbent firms are seeing their profits increase and there is enough growth potential for all. In such cases, companies would not need to fight with other competitors to gain a market share. Another factor is the degree of differentiation in the market. If the firms are offering products that are differentiated from each other, all firms have their own segment of the market and the need to engage in price wars is low. In a way, the existing firms have divided the market between them and there is enough space for all. Therefore, the intensity of the rivalry is also low. Another factor that affects the intensity of rivalry is exit costs. If the cost of leaving the market is very high, firms have more incentive to fight for their position in the market. On the other hand, if the exit cost is low or insignificant, then the incentive to fight will be lower.

To summarize, some of the aspects to consider for the intensity of rivalry are as follows:

- Number of competitors (direct competitors and close competitors)
- Size of the competitors
- Industry growth rate
- Exit barriers.

A high intensity of rivalry means that competing firms are fighting for the market and as such, the potential for profitability is reduced. Naturally, firms would prefer if the rivalry were low.

2.3.2.2 Threat of New Entrants

Companies within an industry wish the threat of new entrants (new competitors) to be low. If it is easy for others to enter the market, competition will increase, and profitability will decrease. The higher the barrier to entry, the less threat of new entrants. The position of a company will be better if the barriers for new entrants are high.

There are several factors that act as barriers for new entrants. One is large capital requirements. If entering an industry requires investments that are not easily recovered (sunk costs), it is discouraging for new entrants. For instance, if a company wants to enter the theme park market, they have to invest heavily in building up new and exciting parks and rides. If they fail, they face high sunk costs (investment they cannot recover), as it would be difficult to find buyers for all the properties and equipment. In such cases, the requirements to enter the market is discouraging. Firms that are already in the market have an advantage. Such firms (called incumbents) can make it difficult for new competitors by, as an example, investing heavily in marketing. A new firm might find it very difficult to afford keeping up. Another example is strong customer loyalty or brand name. Yet another example is exclusive agreements with key retailers or distributors that simply will stop new firms from using the existing sales channels.

To summarize, some of the aspects to consider for the threat of new entry are as follows:

- Switching or sunk costs
- Economies of scale
- Learning curve
- Capital requirements
- Intellectual Property (patents).

The higher such barriers are, the more difficult or unattractive it will be for new firms to enter the market. Therefore, high barriers increase the potential profitability and the position of incumbent firms in that industry.

2.3.2.3 Threat of Substitute Products or Services

Products and services that are not directly competing with a firm's products or services are called substitutes. In the eyes of the consumer, under certain conditions, such products can be seen as a substitute for a firms' products. For instance, Coca-Cola is not a substitute for Pepsi as they are directly competing, but orange juice might be. Substitutes are products that consumers might see as an alternative to a product.

Factors that affect the threat of substitute products or services can be explained by how easy or difficult it is for the buyer to switch (switching costs). The easier it is to switch, the greater will be the threat of substitutes. An important factor that needs to be considered is the price. Price affects substitutes. A consumer might choose orange juice but if the price increases, he or she will switch to another alternative that is cheaper.

In an industry where there are fewer substitutes available, the potential profitability is higher and vice versa. It is beneficial for incumbent firms if the threat of substitutes is low as the risk of consumers switching products is less.

To summarize, some of the aspects to consider are as follows:

- Buyer propensity to use substitute product
- Product differentiation.

2.3.2.4 Bargaining Power of Customers (Buyers)

The bargaining power of the buyers refers to the degree with which buyers can put firms under pressure. If the buyer has several options, their negotiation power will be stronger and therefore the bargaining power of the customer is higher. From a firm's perspective, the lower the bargaining powers of the customers are, the higher the potential profitability of the industry.

Consider a family who wants to buy an SUV car in a town with two or more dealerships selling comparable SUVs. The family can simply go to each dealership and say that the previous dealer offered a certain price and ask if they would make a better offer. By doing so, the family has the upper hand and has a higher bargaining power. This naturally leads to lower prices and lower potential profitability. However, if there is only one dealership in town, the bargaining power of the family is lower.

To summarize, some of the aspects to consider are as follows:

- Buyer access and availability of information
- Volume
- Sensitivity to price
- Cost for buyer to switch
- Relative bargaining power/leverage of the buyer.

2.3.2.5 Bargaining Power of Suppliers

The bargaining power of suppliers refers to the degree of power the suppliers have in setting prices and conditions. When the bargaining power of suppliers is higher, they have a better negotiation position. Firms, therefore, prefer situations where the bargaining power of the suppliers is low.

If the suppliers of a key resource are few, the firms do not have much choice and must turn to the few available suppliers. However, if there are many suppliers in the market, the firms have a stronger position and the bargaining power of the suppliers is lower. Another factor is the degree with which a firm can substitute its input materials. If a firm can use a similar product as input, it will have more choices. If the suppliers increase their prices, the firm can choose a substitute and therefore the bargaining power of the suppliers is lower. Yet another factor is how difficult it is for a firm to switch to another supplier. If a company is "locked in" with a supplier via long term contracts, it will be more difficult to change supplier and that gives them better bargaining power. Finally, the bargaining power of the suppliers will be lower if they cannot forward integrate (i.e. doing what a buying firm does).

The bargaining power of suppliers will be higher or lower depending on the terms they can dictate. The potential profitability of a firm and the industry is higher if the suppliers have low bargaining power. The firms can maintain profit or increase profit by pressuring the suppliers on price. However, if the suppliers can increase prices without losing contracts, the firms buying from such suppliers will see their costs increase.

To summarize, some of the aspects to consider are as follows:

- Concentration of suppliers
- Volume
- Margin (cost relative to price)
- Bargaining power of the suppliers.

2.3.2.6 Critique against the Five Forces Model

The five forces model has been criticized. Perhaps the most prominent critique has been the indirect encouragement for companies to develop strategies that build a competitive advantage based on avoiding competition. If one uses the industry forces as the only basis for strategic development, the most efficient strategies will be those that create barriers preventing others entering the market, limiting the bargaining power of suppliers and buyers, and reducing rivalry to the level of having a monopoly or oligopoly position in the market. Such strategies discourage innovation, product development, and seeking ways to offer more value to customers. Perhaps it would work for a while in some industries, but not all. The five forces analysis is a good tool to understand the market in which a company operates but not as a stand-alone basis for strategic development.

2.3.3 The Five Forces Framework in the Digital Age

The recent waves of digital technologies have impacted the markets. Porter's five forces framework has stood the test of time and seems to still apply quite well. However, the dynamics have changed within each of the forces with the entrance of digital technologies and primarily, digital based companies. With regards to "threat of new entrants", we have seen how digital business models have required less capital but enabled economies of scale. In a traditional market, taxi companies, for instance, require setting up central buying systems to purchase vehicles, and metering equipment. However, Uber and other similar companies, such as Taxify, have entered this market with no cars at all. Taxify also allows private persons to become taxi drivers. Via collaborators of Taxify (certain car rentals), private persons can rent a car and drive with the Taxify app.

Regarding threats of substitute products, physical products are either replaced or wrapped with digital products. Digital services built on top of physical ones have

rendered the switching costs to decrease significantly. The buyers' propensity to choose substitutes is also very high. Considering the taxi example, the mobile apps make it easy to switch. For instance, a customer might have both Uber and Taxify installed. Checking both takes almost no time and the buyer will choose the one who offers the better price or is closest (shortest waiting time).

The power of the buyers has increased with digital technologies. The customers have near to instant access to information. Furthermore, with the proliferation of social media, customers consider the many reviews and feedback left by other clients. Via forums, customers can ask questions about products and services. Finally, by using digital channels the switching costs are low. A customer has the option to buy an item from a physical store, a local e-business or from China. The decision can be taken by investigating for a few minutes on a mobile app as they are passing a store.

Rivalry is also getting more intense. A traditional taxi driver is not competing with other taxi drivers anymore but with both traditional and digital taxi services. Taxi drivers are not only competing with other licensed taxi drivers but with private persons who have rented a car and drive on weekends to earn extra money. As mentioned before, the whole world is now available to the customer. Local stores are no longer competing with other stores but with all e-businesses that offer the same products.

The bargaining power of suppliers is also changing. The suppliers have basically taken one out of two approaches. They have either adapted and enabled their services for digital business models by opening up their APIs, or they have fought the new trend by using regulations, suing, lobbying to restrict access and thereby maintain their bargaining power. Although digital technologies have, as it seems, prevailed, a new power structure is emerging. Uber is now developing self-driving cars, and they are forward integrating. Amazon has expanded its reach by entering new businesses. Airbnb has grown and become the dominant player. These companies have a platform and consciously invest heavily in making the platforms grow. As such, they have strengthened their bargaining power as have those on either side of the platform, who have relatively little power of bargaining. In fact, some might find themselves as hostages of the platform provider. If Airbnb or Uber decided to raise their commission by 5%, there are not many alternatives for providers and customers.

2.3.4 Industry Report and Industry Trends

The external context is constantly evolving, in particular in regard to adaptation and innovative usage of emerging technologies. Awareness of such trends might prove to be valuable for the analyst. For instance, consider an analyst working with developing the Internet portal of a company. For such a solution to be "relevant", it needs to be aligned with the trends. If it is not, there is a risk of the portal passing its "best before date" sooner than expected. It is impossible to know which trends will

stick but it is better to have considered than missed them. The analyst is not expected to do in-depth trend analysis for each initiative.

It is sufficient to review a few of the trend reports produced by others. For instance, the major consultancy firms produce industry and trend reports. These reports not only capture the technology trends and how they will affect product offerings, but they also cover business trends. Google will be an invaluable tool in finding such reports. A few simple searches using strings such as "trend report" combined with the current year and industry of interest, will result in many hits. Valuable input can be found by viewing videos (streams) from related conferences where experts are invited to share their ideas, from various blogs and articles that discuss trends and future direction, reports and publications authored by different think tanks, consultancy firms such as McKinsey or Accenture, interviews with experts, and CEOs of different companies and organizations.

Chapter 3
Internal Business Context

The external environment analysis examines the major trends in the market and the immediate forces within an industry. Such analysis considers the environment that the organization is operating in but not much about how the organization is structured and how it creates value. In the next section, we will take a closer look at the internal context. The internal context is those factors that are within the boundaries of the organization but outside of the scope of the problem being worked on by the analyst. As such, the internal context can have a tangible effect on the solution and on how the business analysis/project work is set up and conducted.

There are no standard sets of perspectives to use when considering the internal context of an organization. However, by considering the "organizational strategy", "business model and capabilities", "stakeholders", "organizational structure and culture", and "internal policies" one captures the essential aspects. Certain unique projects might require considering the internal context from additional perspectives but mostly, these perspectives listed above will be comprehensive enough.

A word of caution at this time. The analyst does not start working with producing all the models and analyzing the internal context of the company. The internal context affects the whole company and as such, covers much more than the particular initiative the analyst is working with. The analyst works at an organization and is aware of the internal context. If that is not the case, it is good for the analyst to get an overview of the internal context. This is achieved mainly by analyzing existing documents or interviewing but not by conducting the actual work of analyzing and documenting the policies, business model and so on. Although it might be required of the analyst to do some work related to the internal context, mostly it will be analyzing and understanding how the context might put constraints, restrict, enable, guide or affect the change being investigated.

F. Milani, *Digital Business Analysis*,
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3.1 Organizational Strategy

We have already discussed what corporate strategy is and how it has evolved over the past decades. An analyst will seldom be part of formulating or analyzing corporate strategy at this level, as it is mainly the work of the top management of an organization. However, the organizational strategy can have an influence on the solutions. In certain cases, it might even affect the evaluation of alternative solutions and cause one or two alternatives to be discarded. The analyst does not need to analyze the organizational strategy, because, in most cases, it has been documented. It will be sufficient to have an idea of its outline and main points. If the strategy has not been documented and the analyst finds it interesting and relevant to become acquainted with the strategy, one or two interviews with the right persons will provide sufficient information. Bear in mind that if the analyst works for the company, as opposed to being a consultant, they are usually fairly well acquainted with the strategy and do not need to re-visit the matter.

3.1.1 Business Model Analysis

Although there are many definitions of what a business model is, most focus on how an organization creates and delivers value in a (hopefully) profitable way [21, 22]. In recent years, the business model canvas has become the most widely used framework for illustrating how a company creates and delivers value to its customer segments. A business model can be viewed as "the strategy" of a company but it is not the same as the organizational strategy. The organizational strategy works on a more corporate level. For instance, a car manufacturer such as Volkswagen has, as one of its strategies, to offer cars for all customer segments. As such, they invest in developing and manufacturing cars that range from small to vans. They had an ambition of becoming the largest car manufacturer in the world and had developed a strategy to achieve this goal. However, a business model canvas [23] focuses on one or a set of related products or services and not always on the whole company. If a company only has a few products/services, the business model might cover all the products. There is a key difference between the business model and organizational strategy. The business model captures and represents how a company has made its internal setup to deliver value to customers in a profitable way. Organizational strategy encompasses aspects that are beyond what is captured in the business model such as overall financing and funding.

The business model canvas consists of nine building blocks as presented in Fig. 3.1.

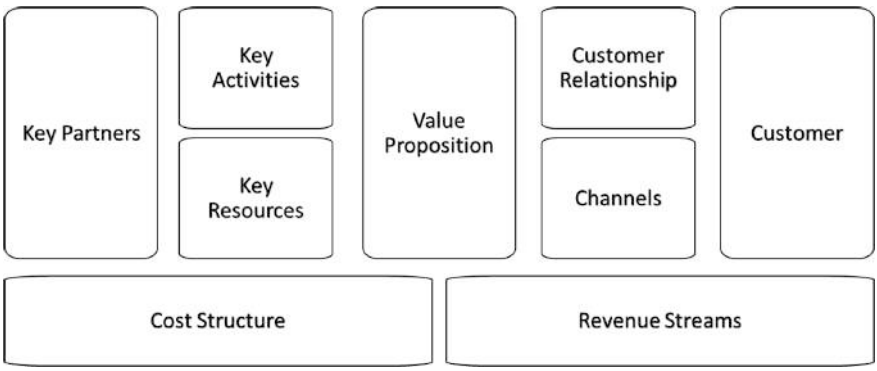

Fig. 3.1 Business model canvas (based on [23])

3.1.1.1 Customer Segments

Customer segments represent the consumers of the value offered by a company. In a good business model, the value proposition is aligned with its customer segments i.e. those who ultimately use and pay for the value. The important question is, who are the customers and what issues do they have that can be solved? When discussing customers, three aspects are analyzed. The first is "customer jobs" which is a description of the things the customers are trying to get done. Customer jobs are of three types:

Functional Jobs: These kinds of jobs refer to performing or completing specific tasks or solving specific problems such as cooking, tracking time, cleaning the apartment, writing reports, transportation and so on.

Social Jobs: Social jobs refer to times when the customer wants to look "good" or gain social value or reputation. These jobs are about how the customer wants to be perceived by others.

Emotional (personal) Jobs: Emotional jobs refer to times when customers aim at achieving a certain emotional state or feeling. An example is going to the movies or watching a TV-series. Emotional jobs can also be about achieving a state of peace of mind or feeling secure.

The above are the different types of jobs that a customer may have. When performing such jobs, the customer might feel inconveniences or issues. Such feelings are called "customer pains". Customer pains are anything that causes the customer to become annoyed before, during, or after getting a job done. It can also be anything that prevents a customer from getting a job done. Customer pain can be undesired outcomes or problems such as things don't work, or do not work well, things that cause undesired side effects, or give the customer bad feelings when doing a job. Pains can also be ancillary, for instance customers feeling annoyed because they have to go to the store or a governmental agency to get a job done.

Obstacles can also be customer pains. An example is when the customer cannot afford any of the existing solutions for a problem they have or a job they need to do. Anything that stops or slows the customer down doing their job, is an obstacle.

The third component is customer gains. Customers usually have minimum expectations on the product. There are features that simply have to be there. These are the required gains. For a smartphone, the required gains are for instance calling, texting, connecting to Wi-Fi. Beyond the required gains, customers might expect additional gains. For instance, when buying a smartphone, there are expectations on design, performance, storage, camera, screen resolution and so on. Commonly, such gains are directly related to price meaning, the more of such gains you wish, the more you have to pay. Finally, customers might get unexpected gains and that is when the value proposition goes beyond the expectations of a customer. For instance, App Store was an unexpected gain for iPhone buyers when it was introduced as it offered many new things that excited the customers. Unexpected gains soon become expected and finally perhaps even required gains. Consider the first smartphones. The battery life was short but with the development of the batteries, they got longer. Today, it is a required gain that the battery lasts a few days. What was once an unexpected gain, is now a required gain.

All customers are not identical and not all value propositions will attract all customers. It is, therefore, necessary to divide the customers or markets into segments where each segment shares common characteristics. These segments will be targeted by an organization when offering their value proposition (products or services). The segmentation can be very different depending on what kind of products/services it concerns. The segmentation can be based on gender, income, age, locality, lifestyle, and attitudes of a group of potential customers. One of the tools for customer segmentation is "persona analysis" which we will return to later. Segmentation could also be based on different markets. There are commonly four types of markets and the adoption of new technology in different markets varies.

Before we discuss the four market types, let us take a brief look at the technology adoption life cycle [24]. It has been noted that when a new technology or product is introduced to the market, it is not instantly accepted. In fact, the adoption of new technology follows the normal distribution curve as can be seen in the Fig. 3.2.

The first ones to buy the product are the innovators. They love to try out new products and share their opinions about it. The innovators are in the minority and constitute about 2.5–3% of the population. Following the innovators, are the early adaptors. The early adaptors share some of the sentiments of the innovators but not to that degree. This group is slightly larger and is about 15%. The early majority are the group of customers who start adopting the new product, whereas the late majority are more conservative and will adopt it later. These are the largest group and constitute about 35%. The final group, the laggards, are very conservative and are the last to adopt a new product. You might have noticed a gap in the early adaptors. This is the chasm. Geoffrey Moore [24] proposed that for "disruptive" innovations, there is a gap. When a new product emerges, there is a lag or delay

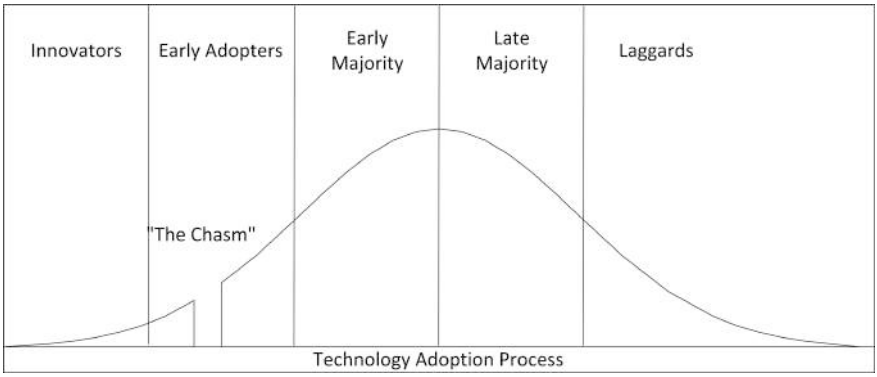

Fig. 3.2 Technology adoption life cycle

between early adaptors and the early majority. These two markets are inherently different and crossing the chasm simply refers to getting the product to the early majority in a way that they also adopt it. Note that this applies only to new technological innovative products and not within an existing market. Let us now return to the different markets and see how they interplay with the technology adoption process.

Existing Markets: In existing markets, the market is known. There are others who offer the same value proposition and it is a competitive market. It is a "red ocean". Customers in such markets seek substitutes that are either faster, cheaper, or better. If a company wants to gain market shares, they have to offer a value proposition that is cheaper, faster, or better than the other comparative products. As customers are comparing products, this market is very technology driven. They can also seek to offer superior quality or add functionality. Regardless, in order to offer such alternatives, the technology needs to be brought into focus.

In existing markets, the products are known and there is no chasm. Customers will seek the best products and companies will gain market share (at the expense of another company) by being superior in some sense. As such, if a company manages this well, do their marketing properly, they should get a linear growth in revenue from sales as indicated in the Fig. 3.3.

Re-segmented Markets: If a company finds a new segment within an existing market, they have managed to re-segment the market. Food is an existing market, but when the concept of organic food was introduced, it created a new segment within the food market, targeting certain customers. A niche was created, and the market was re-segmented. Airlines such as JetBlue and Ryanair have "re-segmented" the air travel market by offering tickets to anyone willing to travel cheaply. Airlines such as SAS or Swiss Air, on the other hand, offer a variety of ticket prices for the same routes as they target potential clients who do not necessarily see the lowest price as the only or main parameter when traveling.

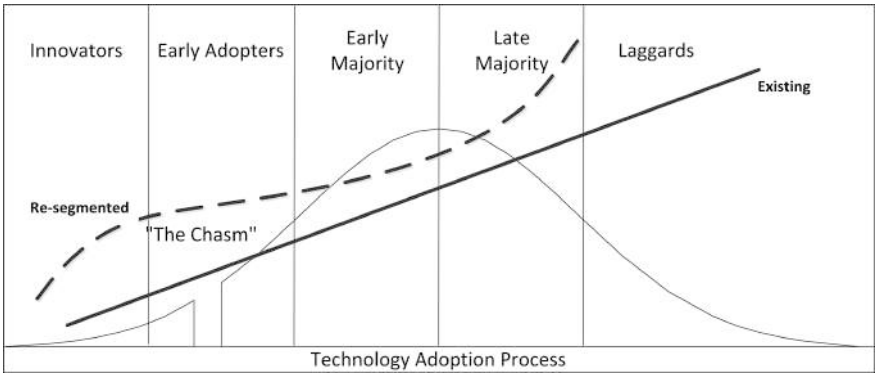

Fig. 3.3 Revenue patterns for existing and re-segmented markets

Re-segmented markets are an example of "blue ocean" strategy as opposed to "red ocean."

In re-segmented markets, there is a small chasm. Sometimes, the customers do not really see the difference. For instance, when low-price airlines such as Ryanair and JetBlue came to the market, many thought these were like Swiss Air or Delta Airlines. However, as customers experienced, they were cheaper but so was the service. Soon enough, customers understood the difference, and some chose the low-price airlines and others went back to "normal" airlines. Similarly, the revenues pick up in the beginning but plateau over the chasm. At this stage, customers need time to adopt. The revenues start increasing once the early majority begins adopting.

New Markets: A new market is when the customers and the products simply don't exist yet and the value proposition offered is brand new. It is a "blue ocean" strategy. Examples of products that created new markets are iPhones and iPads. In new markets, the chasm is bigger (see Fig. 3.4). In fact, there is a challenge for the companies to "convince" the customers that their product is good and how it can get their jobs done. This might take time and therefore, the chasm is bigger. During this period, revenues are not growing, and many companies go out of business. This is because the much-needed revenues come after the chasm has been passed whilst the costs are still there. However, if and when the chasm has been passed, the revenues increase almost exponentially.

Clone Markets: Clone markets are simply copying a proven business model and product/service in one location and pasting it in another location. It does not have to be the same company that does this. For instance, Baidu "cloned" Google search engine to the Chinese market. However, the solution needs to be adapted to the local market. In this adaptation, consideration has to be given to local sentiments, customs, regulations and so on. For instance, let us assume a company such as Amazon wants to "clone" its business model in another country. If they use the exact same model where the payments rely heavily on use of credit cards, it might

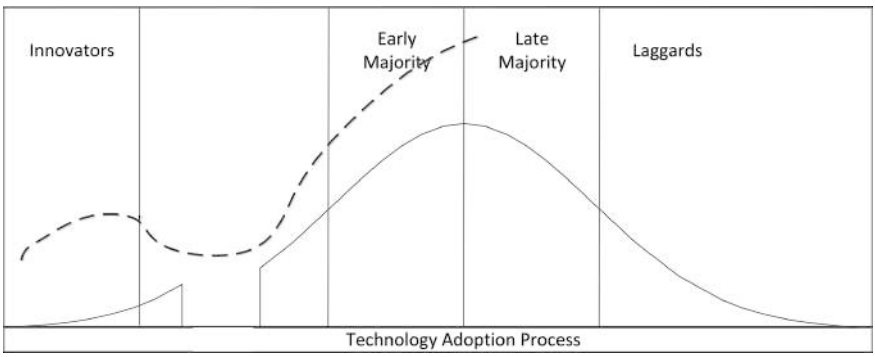

Fig. 3.4 Revenue pattern for new markets

not succeed if credit cards are not widely used in that location. In such a case, the payment could perhaps be made on delivery.

3.1.1.2 Value Proposition (Products or Services)

The value proposition represents the product or service that meets the needs of customers. The value proposition is what the company offers that has a value for customers by being, for instance, cheaper, better, faster, less risky, creating social status when getting a job done for the customer [25]. Skype offers free Internet and video calling and MasterCard offers a platform of non-cash payments for card-holders, financial intuitions, and stores. Skype creates value by allowing those with an account to call (audio and video) friends and families all over the world for free. MasterCard offers value by managing payments safely and conveniently. We will explore value proposition in more detail later (current state analysis).

3.1.1.3 Channels

Channels concern how the organization reaches its customer segments and how they deliver their value proposition. The work with reaching out to potential customers is about getting customers and tightly related to marketing.

There is a difference between physical and digital products in regard to getting customers. For physical products, the companies aim at getting attention from paid and earned media. Paid media is simply when companies pay to get your attention by means of advertisements, trade shows, sponsorships and the like. Earned media is when companies get your attention by publishing papers, speaking at conferences, uploading videos on YouTube and similar spaces, posting blogposts, and the use of social media. Naturally, earned media will also cost money but with the earned media, a more indirect approach is chosen. Regardless of approach, the main

purpose is to get interest in the companies product. The purpose of both paid and earned media is simply to create awareness that the product exists. Following this, the challenge is to promote interest in the product so that the customer considers and finally purchases the product. At this point, the value proposition must be delivered to the customer.

Channels also consider how an organization delivers its value propositions to its customer segments. If we take a historical view and go back to the beginning of the previous century, products used to be physical and delivered via physical channels (stores). However, somewhere around the 1920s intangible products such as stocks or insurances were introduced but still sold through physical channels. The physical channel remained dominant until the emergence of the Internet. As the Internet infrastructure grew, intangible channels emerged. The development of intangible or digital channels have grown and shopping across channels has become commonplace. The development is progressing along this line and the "right" products/services are increasingly being delivered via the "right" channel. In other words, the customer decides how and where to buy.

In essence, we have physical and digital products delivered via online and/or physical channels. All channels are still existing and equally valid but certain companies have decided to go in a certain direction as part of their business model. Physical products such as cars, books, or any other kind of physical products, can be bought via physical channels. However, the same kind of products can be bought via online channels. For instance, Tesla sells cars and Amazon sells books and thousands of other physical products via online channels. Google, Twitter, and Facebook sell their intangible (digital) products via online channels whereas SAP and Oracle sell their intangible products (software) via physical channels (sales representatives).

Once the customer has purchased a product, the aim is to "keep" them. It is much cheaper to keep customers than to get new customers. Therefore, it is financially much better to have your existing customers return as compared to finding new customers. If we consider the steps of awareness, interest, consideration, and finally purchase process, customers can drop out at any stage of this process. Companies try to keep existing customers by offering loyalty programs that offer discounts, great deals, bonus points and the like.

Just as keeping a customer is cheaper than finding new customers, selling more to existing customers is cheaper and a better investment than just keeping customers. One of the ways to "grow" customers is to "unbundle" products i.e., split or decompose the product in separate parts and sell them separately. Another is cross-selling where you, for instance, get a discounted offer to buy a new stereo system when you buy a new car.

A digital product follows in principle the same steps as a physical product. However, the "get" part is different. The paid and earned media are the same. The aim is not primarily to create awareness but to get the customers to visit the webpage. However, just having customers visit the webpage is not enough. Companies have made this simple, so it is a matter of few clicks and one can log in with a Facebook or Google account. The objective is to have them activated i.e., to

have customers register, and eventually pay for the services. That is when the company gets the revenues. Following this step, a similar process applies for keeping and growing the customer base.

3.1.1.4 Customer Relationships

For a business model of a company to be sustainable, they need to identify what type of relationship they want to have with their customers. Customer relationship concerns how the company communicates with its customers. Consider an example of a private banking firm who targets very wealthy clients. They would manage communications with their clients in a different way to a low-cost bank. The types of relationship the company decides to support is connected with their value proposition and customer segments. Generally, the main types of customer relationships are as follows:

- **Personal assistance:** Customer relationship that is based on human interaction such as face to face, phone, chat, or emails, is a form of personal assistance. Considering the need for trained assistants, this is one of the more expensive ways of customer relationship. Naturally, it will vary depending on the complexity of the issues and if it can be outsourced.
- **Dedicated personal assistance:** This strategy is a more developed version of personal assistance. In such cases, like the example of private banking, a representative is dedicated to a set of individual clients. Companies such as IBM have key account managers who serve one of their larger clients. This type of customer relationship is common when the customers are very important (generate high revenues for the company) but also more expensive.
- **Self-service:** Many companies offer self-service. In essence, they want the customers to find the answers to their problems on their own by using, for instance, the FAQ on a website. Naturally, it might be time consuming for clients to find the answer they are seeking but it is a relatively low-cost strategy for the company.
- **Automated services:** Automated services are essentially combining self-service and automated processes. For instance, it was mentioned that chats are a form of personal assistance. Chats made by humans can be analyzed to create "chatbots". Chatbots simply do the work of a human when talking with customers. When a customer selects to get help via chat, it might be a robot that reads your questions, and either answers it, or directs you to where to find the answer. A universal bank receives many calls and chats concerning what they should do to order a new credit card or apply for a loan. These are fairly simple tasks that can be automated. A chatbot would read the question and understand what the customer is seeking. Based on this, the chatbot will answer the question of how to order a new credit card and perhaps even direct you to the website where this can be done. Next step is "softbots" that will not only give you the answer but help you execute the process as well.

- **Communities:** A user community is where other users help you with a problem or to answer a question. In such strategies, the company does not offer customer support directly but rather, the community will help you out. It should be noted that such communities are not exclusively for customer support but serve other purposes as well.

3.1.1.5 Key Activities

Any company will engage in a set of key activities that produce the value proposition. In this part of the canvas, those "key" activities that are most significant for their value proposition creation are listed. If a firm creates value for a customer segment by offering a product at a very low cost, it is important to keep the costs low if they wish to have any profit. In this case, their highly efficient supply chain or production process is perhaps one of the more important key activities. The key activities are those required to make the model work and as such, it includes the activities needed to make the customer relationship and the channels function as well. Generally, there are a few categories of key activities:

- **Production**: Manufacturing firms would typically focus much attention and development on operations management i.e. improving the production processes. Processes involving design, production, and delivery of products are focused on, with special attention given to, production of larger quantities and/or superior product quality.
- **Problem solving**: Firms that offer solving complex problems as their value proposition have problem solving as their main category of key activities. These companies try to come up with new solutions that are customized to individual customers. Examples of such companies are consultancy firms, hospitals, and service organizations. Such firms focus much effort on knowledge management and training.
- **Platform/Network**: Some firms rely on their platform to enable their value proposition. MasterCard and Visa are examples of such firms as they offer customers transaction platforms for the stores and credit cards via banks or companies. Another example is E-bay that has its website as a platform for connecting those who wish to sell with those who seek to buy a certain product. Such companies focus their key activities on maintaining and developing their platform by means of platform management and promotion.

3.1.1.6 Key Resources

Key resources are those "key" resources that are necessary to make the model work. Such assets can, for instance, be primarily physical as in the case of capital-intensive industries. Manufacturing firms require a range of facilities, equipment, and machines. The diamond industry (or any mining company) requires

physical resources in order to mine, sort and distribute its product. Other companies such as Wallmart (stores) and Amazon (warehouses) also rely on physical resources to make their business model work.

Other companies might have intellectual property as their key resources. Such resources might be brand, patents, partnerships, or customer databases. Nike and Sony rely on their brands, whilst Microsoft and SAP have their software and intellectual property rights, and Intel has patented designs for processors. This type of resource is very important and valuable. Companies have bought other companies for billions of dollars mainly to acquire patent portfolios.

In knowledge intensive and creative industries, humans are the key resources. Pharmaceutical companies employ qualified human resources for research and development, sales representatives, and advertisers. Companies such as Apple and Google also have human resources as key, in particular for their development teams.

Finally, the fourth category of key resources concerns financial resources. An example of this would be a company needing finance to construct a Hydro-Electric scheme for ABB, which can and often do, finance such investments with loans from ABB Finance. IBM also offers similar solutions. In essence these companies have financial resources among other resources as a key resource to make their business model work in that they help the customers buy their products.

3.1.1.7 Key Partners

This building block focuses on the partnerships that are required to make the business model work. Let us consider a fictional example. Consider that a company does everything by itself. For every capability or function, they build up that capacity internally. It might be anything from mining the raw materials to supportive functionalities such as cleaning. Such an organization will be very large and such a structure would force the company to manage more areas that are not related to their value proposition as compared to those directly related to their core business. This is simply not efficient. On the other hand, assume a company does not hold any capacity whatsoever. Instead of having it under their own management, they can go to a market and procure it whenever needed. Such an organization will be very slim and agile, but the costs associated with getting the required resources would be very high. In fact, such a structure would force the organization to spend more time getting resources than focusing on their core business. Somewhere between these two extremes, lies an optimal balance of what a company should include in their own capacities, and what have access to via partnerships.

As explained above, the main reason for partnerships is reducing costs, as it is more efficient to focus on one's core business. Some of the partnerships will be "key" for making the business model work i.e. be more important. The partnership can take shape by forming joint ventures to reduce risk. Another partnership is strategic alliances. iTunes is an example of a successful strategic alliance where Apple offers the hardware and software for listening to music, but the record labels

offer the content. Key partners can also be suppliers of a resource. Another example is "Dropbox" who use Amazon's services for storage of all their clients' files. Another reason to partner up is to get access to resources that are simply too expensive to build up. Starbucks, who produce coffee, do not have production facilities and distribution channels but Pepsi does. So, Starbucks partnering with Pepsi allows both to benefit from each other's core competencies. In fact, they did partner up and brought "Frappuccino" to the market. Likewise, a soft drink producer such as Kanes, based in California, can get access to foreign markets, such as Europe, by partnering up with local beverage producers.

3.1.1.8 Cost Structure

All activities in organizations cost money but the cost structure will vary depending on the business model. Cost structure describes the most important financial characteristics of the business model. Costs are usually divided into fixed or variable. Fixed costs are those that do not vary with the volume, such as salaries and taxes. Variable costs have a direct relationship to the quantity, such as costs for direct materials or commissions. All firms will experience both fixed and variable costs, but the ratio might differ depending on the business model.

Another aspect of cost structure is the relative importance of costs for a business model. Hyundai is a firm that focuses on reducing costs, while others focus on creating value; Bentley would be an example. Hyundai will have a "cost-driven" cost structure whereas Bentley has a "value-driven" cost structure.

Some business models might require economies of scale (costs reduce as volumes increase) whereas others operate on economies of scope (expanding the product line to products related to the original product). In economies of scale, a firm wants large orders. Software companies are a good example. Their initial cost of developing the software is high but once it is finished, it does not cost more to "produce" additional copies. Business models operating with economies of scope will benefit by offering related products such as Colgate who sells toothpaste, toothbrushes, mouth washes and so on.

3.1.1.9 Revenue Streams

Any given company seeks to be profitable in the end. Profit is simply revenues minus costs. The business model, if it is to survive, has to generate revenues. Revenue streams describe how companies generate revenues from each customer segment. Revenues can be generated by different means as listed below:

- **Asset sale**: This is perhaps the most common type of revenue stream Revenue stream we encounter in our daily life. It is simply the selling of ownership of a physical product such as books, food, cars, or electronics.

- **Usage fee**: This type of revenue streamRevenue stream is based on how much a customer uses a service or product. Examples can be phone calls (pay per minute), hotels (pay per night), or DHL (pay per package sent).
- **Rent/lease**: Rent is based on temporary (time based) access or right to use a particular product or service for a fee. Examples of rent are apartments or rental cars.
- **Subscription fee**: Subscriptions are based on ongoing or continuous access to a service such as membership (fitness clubs), online games (World of Warcraft), or Spotify (monthly fee).
- **License fee**: Such fees are based on granting access to customers to some intellectual property in exchange for a fee. Examples are patents such as Bluetooth, or Microsoft Office Package software. In essence, one has not bought the software but has a license to use it. The difference between asset sale and license fee is that in the case of the asset sale, ownership is transferred to the buyer. With a license fee, the ownership is still with the seller.
- **Brokerage or Intermediary fee**: Such fees are based on a cut brokered between two parties, that use this service, after a successful transaction. Credit cards use this kind of revenue streamRevenue stream as they take a percentage of each transaction; real estate brokers and online trading platforms do exactly the same.
- **Advertisement fee**: This kind of fee is based on fees in exchange for advertising a particular product, service or brand. Examples include those within the traditional media industry (TV, Radio, and Newspapers), social media (Facebook), and webpages (WordPress and Google).

3.1.2 Digital Enablers and Influencers of Business Model Canvas

All the building blocks of a business model canvas are affected by digitalization. Here, we take a look at a few examples of how digitalization can enhance, modify, or innovate the building blocks of a business model.

Value proposition, be it physical product or a service, is gradually moving away from being asset-intensive to data-intensive [26]. At the asset-intensive point of the spectrum, the value creation is fully dependent on the physical product or human interaction for services. Data-intensive products, on the other hand, create value incorporating data dependent digital features with the product or service. The move from asset-intensive to data-intensive value proposition can follow four main steps [26]. The first step is to augment the value proposition with simple digital features. The second stage focuses on adding digital products or data-based services to the value proposition. The third stage deepens the use of data analytics and development of distinctive online platforms. The last step is when the value proposition is integrated in a digital ecosystem, allowing customers to move seamlessly to and from third-party partners.

A manufacturer of gym equipment, such as Technogym, produces physical products. The value proposition Technogym delivers was asset-driven (equipment). The first step in moving the value proposition towards data-driven was to integrate activity tracking elements to the equipment. The simple digital features are for instance showing the time, distance, burnt calories, and heart rate pulse. The next step is to add digital products. Technogym added entertainment systems allowing users to watch movies, play games, and listen to audio streams while using the equipment. In the third step, data analytics are incorporated with the product. Technogym took this step by including functionalities for individual data collection and analytics. Users can log on and use their account to record and track data on their exercises. In the last step towards data-driven value proposition, integration with a digital ecosystem takes place. For instance, Technogym could introduce a mobile app offering functionalities for following and analyzed training data obtained from the equipment. Such mobile app also allows users to seamlessly data collected from other exercises such as biking and jogging gathered by the mobile phone (GPS tracking) and other activity tracking application (health apps) and devices (Apple Watch).

In the quest to get, keep, and grow customers, data-driven categorization methods are being used. With the use of data, micromarketing techniques can serve to predict the probability of for example a customer discontinuing their engagement. Micromarketing relied initially on postal codes to target potential customers. With the proliferation of social media, access to more nuanced data has enabled refined targeting of customers. Potential customers are increasingly targeted based on parameters such as attitudes, interests, digital behavior [27].

Data-driven methods allow for both descriptive and predictive analysis of churn. For instance, RFM [28] is a descriptive method where customers are segmented based on recency (R), frequency (F), and monetary value (M). By analyzing recency (time since last purchase), frequency (how often the customer makes a purchase), and monetary value (how much the customer spent), customers can be clustered in different segments. One of the clusters can encompass customers most likely to churn (discontinue their engagement with a company). Other methods can help "grow" the customer. For instance, when searching for an item on Amazon, additional listings of items are presented. These listings are recommending additional items to be based on "customers who viewed this item also viewed" (upselling) or "frequently bought together" (cross selling).

The value proposition is delivered to the customer via channels. Digitalization has opened the space for using digital channels for marketing, ordering and delivering goods and services. Digital channels are websites, social media sites, digital media (video and audio streaming, mobile apps, games, online events (e.g. webinars), and direct digital communication (email and messaging apps). Digital channels do not necessarily make physical ones obsolete. In the late 1990s, Apple used partners to sell their gadgets. However, commission based and inadequately trained staff were not motivated to sell Apple products adequately. Apple therefore opened their own retail stores to both sell and promote the Apple brand. Today, Apple uses both physical and digital channels to sell their products successfully.

Digitalization has blurred the lines between different channels. For instance, multi-channel selects suitable channel (physical and digital) and focuses on improving the efficiency and performance. Omni-channels, on the other hand, aim at creating a seamless shopping experience, from consistency of message, to viewing, ordering, and delivery for customers regardless of where they are or how they choose to purchase. Customer experience becomes the focus in omni-channels. An example is Value City Furniture (VCF). VCF have an "easy pass"[1] concept where users can create a digital wish list. When the customer visits the store, the shop assistants know what the customer wants and what to show. Likewise, when in the store, the customer can add items to their wish list and submit an online order later. Digital channels can be taken a step further by "melting" the channels into one. Melting channels is involving digital assistants or singular apps as middle-men who aid the customer by doing the channel surfing. The customer is essentially working with the digital assistant and not the company itself. Another approach to melting channels is by providing several services via one digital space [29]. For instance, WeChat[2] was originally a messaging app but has expanded. Today WeChat is more a platform from where one can order a taxi, pay bills, book a doctor's appointment, play games, order food, and much more [30].

Digital technologies have changed the way companies manage their relationship with customers in several ways. Most consumers do online research before they buy a product [31]. One of the main sources of information is the companies' own websites [32]. Companies' websites provide extensive information by means of text (blog posts, news articles, etc.) and visual content such as videos. The content provided is passively communicated, i.e. the content is made available for the consumers to read. Digital solutions have also enabled community-based support, often hosted by the company itself. Products such as Spotify and Apple have forums where users help other users with product support. Such forums allow us to draw on the large numbers of users to provide product support beyond what a company can do themselves.

Digital technologies have also enabled companies to evolve from one-way to two-way communication with customers. Two-way communication is achieved by VoIP (Voice over Internet Protocol) and chats. Such solutions require support staff that perform simple tasks that can be automated. The many chats already logged allow for analysis of the most commonly asked questions and development of software that can answer questions from customers. Such solutions are called "chatbots". Chatbots cost much less than staff, they can answer far more questions that humans can, and they are available 24 h a day all year round. Chatbots can only answer questions and inform customers of where they can find further information. If a customer lost their credit card, chatbots can give them a link to the blanket that needs to be filled in. Artificial intelligence can support human agents in doing their work. For instance, software can listen into the conversation between a

[1] https://www.valuecityfurniture.com/easy-pass

[2] https://www.wechat.com/en/

customer and a human agent. The software can then provide the human agent with relevant information related to the inquiry of the customer. The next step is to have software take over most of the tasks done by human agents. In such scenarios, the software will not only be able to direct the customer to the blanket but also help with filling it out and submitting it.

Digital channels allow for collection of data in ways not possible with physical channels. The data collected can be used to describe consumer behavior, purchase patterns, and predict future actions. In addition, the data can be used to create customer segments. Customer segmentation based on data is faster, better refined, unbiased, and can accommodate changes in customer segments. The refined customer segments can be used to improve channels, customer relationships, and the value proposition as refined insights are drawn. For instance, the US Army commissioned [33] a study to improve the sizing system for female uniforms to reduce inventory costs. Commonly, sizing is categorized based on proportions i.e., all dimensions are reduced with smaller sizes. However, bodies with such characteristics are quite rare. The study analyzed the measures of female US soldiers and based on the data, generated eleven different body types. Unfortunately, the US Army could not use this data to order uniforms as the manufacture's do not follow the idea of body types.

Value proposition, channels, customer relationship, and customer segmentation are front end aspects of a business model. They are front end as they include intensive interaction with customers. These front-end blocks are enabled by a set of back-end blocks. Back-end blocks are also enhanced with digital solutions in the quest of improving cost, time, and quality.

Companies that have production as one of their key activities, use physical assets to create value. Production processes have used smart automation to replace repetitive tasks with machine execution and support workers with tasks that cannot be fully automated. The industry 4.0 is transforming production lines based on digital solutions. The operations of service organizations such as financial institutions, can be seen as the "production process". The operations of such organizations are also affected by digital technologies. One example is Robotic Process Automation (RPA). RPA, in essence, learn from the business rules and the tasks performed by human users and automates the execution of such easier and repetitive tasks [34].

Operational processes are improved by enhanced process monitoring. Data analysis allows for predictive and prescriptive tools for many of the steps of the operational processes. In the pre-digital era, such analysis was conducted based on reports (after the event). Now, the detection is part of the software, allowing staff to take immediate action to prevent delays, unnecessary costs, and ensure quality. The monitoring of processes is closely tied to product digitalization. With digital technologies and Internet of Things (IoT), data about for instance the performance and location of products or items, are captured with the aid of barcodes, QR codes, and other sensor devices. Built-in technology allows for real-time diagnosis about the state of the products. Such data collection combined with predictive and

prescriptive analysis allows for preventive maintenance planning. In essence, digital technologies allow companies to move from working reactively to proactively.

Digital technologies can empower human resources who are engaged in problem-solving activities. Problem solving activities are supported with digital solutions allowing for extraction, sharing, and analysis of information in ways previously not possible. Resources engaged in problem solving accumulate vast amount of information and experience over time. With digital solutions, other employees can access the knowledge by means of online knowledge sources such as wikis and internal knowledge databases. Digital solutions have also enabled mobility of the workforce, allowing companies to attract talents from around the globe.

Businesses relying mostly on physical platforms such as malls, also apply digital solutions to improve efficiency, maintenance, and management of the facilities. Digital marketspaces have emerged alongside the physical marketspaces. Digital platforms have been thriving, both in regard to popularity and profitability. The success is largely due to the fundamental difference between physical and digital marketspaces. The first facilitates connecting consumers with producers in a physical location whereas the second is independent of location. Being independent of location allows for reaching more markets and customers, allows for customers to "shop" when they so wish, and is cheaper for both producers and consumers.

Digitalization, being location independent, has enabled businesses to interact and form partnerships that are mutually beneficial. For instance, Dropbox's business model is dependent on data storage. The core competence of Dropbox is in its solution, not in managing vast servers for storing data. However, Amazon has such facilities. As data is easily transferable and can be accessed from any location, digital solutions enable partnerships like the one between Dropbox and Amazon.

Digital solutions shift the cost structures. The ratio of costs for manufacturing, inventory, and labor costs have reduced in favor of customer engaging costs. Automation and digital solutions within production and operational processes have reduced such costs. At the same time, new business models based on connecting two or more different customer segments have emerged such as Uber and Taxify. Uber is perhaps the larges taxi company but owns few taxis. In such business models, the costs are not for a fleet of vehicles but for development of digital products, platform development and promotion, research and development, and marketing.

Revenue streams have also been affected by digital solutions. Some types of online businesses generate revenues by selling targeted advertisement on their websites. Another type of revenue stream comes from selling or granting an access to online services. Such companies use subscription or "freemium" models. Subscription is commonly used for SaaS (Software as a Service). Freemium, another common model, grants users access to limited functionality but advanced functions, are through paid services. Dropbox pioneered the freemium model where users can store up to 2 GB of data but have more storage space at an additional functionality cost.

Pricing strategies are also affected by digital solutions. Real-time analytics has enabled advanced dynamic pricing strategies. Companies employing such strategies set the price based on different parameters such as time of the day, loyalty programs, demand, and supply.

Business analysis encompasses the "context" within which the solution is to be delivered. The context is both within the solution setting and outside of the boundaries of the company. From the few examples given above, it becomes clear that all building blocks of a business model are deeply affected by digitalization. Digitalization has had and will continue to have an important impact on the both "contexts". For an analyst, digitalization provides ample opportunities to design solutions that add sustained value. Failing to incorporate digital technologies in solutions, will lead to shorter time-span for the solutions and therefore, limited value delivery. Hence, it is important for an analyst to understand how digital technologies can enhance the solutions to deliver more sustained value. The analyst is therefore required to be aware, understand, and follow the digital trends, to understand what opportunities are possible given the available technologies, what can be done with the data collected, and how value can be created by incorporating digital aspects to the solutions.

3.2 Business Capabilities

A business model illustrated the different components required for an organization to deliver value to its customers. However, to achieve their objectives as an organization, the organization needs to have certain capabilities. As such, a capability is what an organization needs to execute their business model and implement their business strategy. In other words, business capabilities are those abilities that organizations have to create or deliver value and achieve a business goal [35, 36].

Capabilities are an abstract collection of resources, processes, and technologies that together, in whatever combination, enable an organization to achieve the desired outcome. For instance, an organization needs to make the market aware of their products so that their customers know they exist and offer a certain product. The organization has a business capability called "marketing" by which the organization, using a combination of human resources, technologies, and processes, achieves the objective of becoming known in the market. Other capabilities most organizations need are "finance", "human resource management" and an increasing need for "data analysis".

Capabilities describe "what" the organization has to do in order to deliver value. As such, a capability that an organization has is only captured once, but that same capability might be used in different processes or parts of the organization. For instance, an organization has "marketing" as a business capability, which is used in different contexts, for different markets, and for different products or services. Regardless of where in the organization it is deployed, it is still the same capability.

3.2.1 Capability Map

Capabilities describe "what" the organization does and, therefore, a capability does not describe "how", "when", "who" or "when" it is done. There are no relationships between the capabilities. Capability analysis and mapping is part of the "business architecture" domain in which the business capabilities are captured and represented in a "capability map". A capability map graphically captures the capabilities of an organization. Most commonly, such a map begins with the highest level and for each main capability area, its sub-capabilities are defined. There are no standard notations on how such maps should be represented. The analyst should not only understand the anatomy of a capability map but also be quite flexible when modeling capabilities.

A capability map clusters and organizes capabilities together. One way to structure the capability map (pattern) is by dividing the main capabilities concerning "management (strategic) capabilities", "core capabilities", and "support capabilities." The terms used differ and sometimes these are divided in more detail. For instance, the management capabilities could be called "envisioning capabilities" or "planning and management." Core capabilities can be divided into "product development", "processing", and "distribution". Different organizations will name these groups according to their own preferences but most of the capability maps, regardless of the naming, will roughly be divided into these main categories. For instance, a financial institution might decide to structure their capability map according to the Fig. 3.5.

In Fig. 3.5, the "management" and "development" would fall under "management capabilities." Likewise, "marketing", "sales", "processing", and "customer support" are "core processes" and "support" is "support capabilities." The capabilities clustered under "management capabilities" might be further divided into sub-groups such as "business model", "business strategy", and "business plan." The sub-group called "business plan" might include capabilities such as "business planning", "budgeting" and "budget follow-up." The main category of capabilities

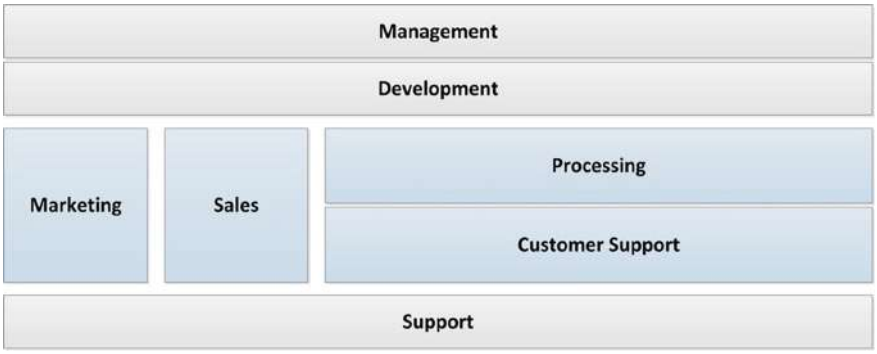

Fig. 3.5 Example of a capability map

named “development” might include capabilities such as “product development”, “service development”, and “competence development.” Marketing and sales are quite self-explanatory, but sales might constitute capabilities, such as, “customer identification” and “packaging” (of products and services).” Processing would in this case be one of the main groups of capabilities. For a financial institution it might be, “payments”, depository” and “settlement.” Customer support might include the capability of “claims management.” Finally, “support” traditionally includes capabilities such as “human management”, “financial management”, and “IT management.”

Figure 3.6 is an illustrative example of a capability map of an insurance company (not comprehensive). As can be seen, the pattern and structure are different, and the capabilities are defined differently as compared with the previous example.

Another insurance company might have defined the capabilities differently from the illustrative example in Fig. 3.6. Furthermore, they might have structured them

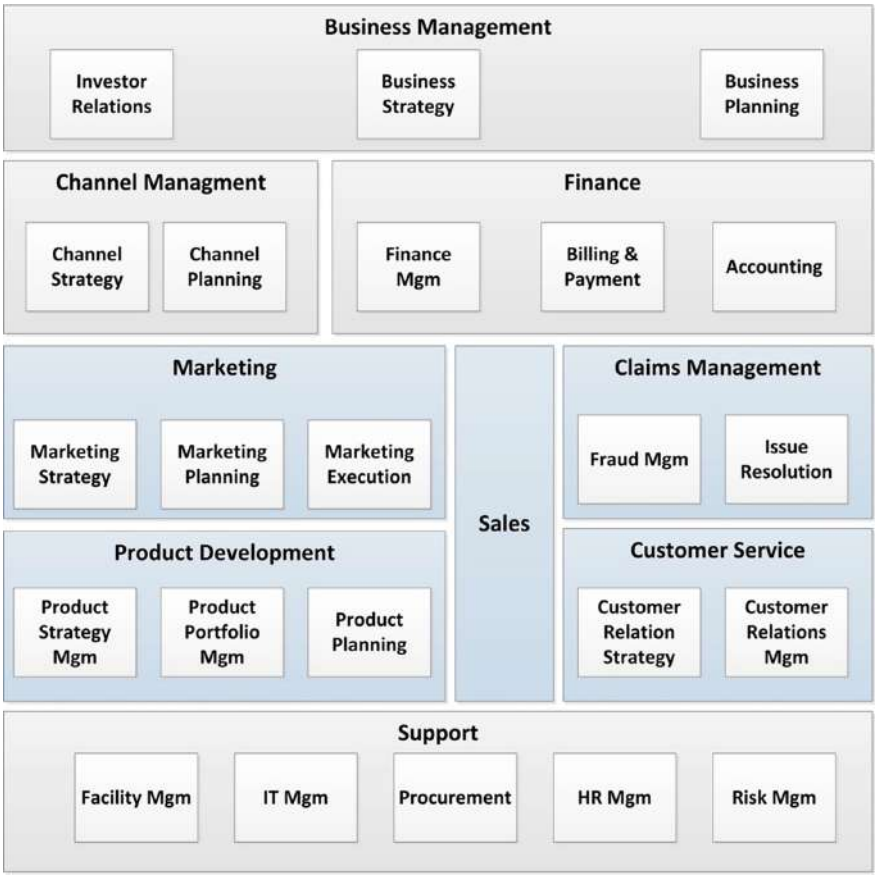

Fig. 3.6 An illustrative example of a capability map of insurance company

differently; however, it is very likely that, regardless of the naming, they will have an overlap of the same capabilities.

The capability map illustrated in Fig. 3.6 capture the capabilities of an organization at its highest level. Each capability can be further decomposed into sub-capabilities required to have the parent capability. Ideally, a capability map should have a hierarchical structure. At the highest level, also referred to as "strata" or "level 0", the capabilities are captured as a classification of "strategic/management, core, and support. At the next level (level 1), the capability groups are captured. In the insurance example, it would be "business management", "channel management", "finance", "marketing", "product development" and so on. Decomposing each of these groups of capabilities, we get the next level (level 2) and we have the actual capabilities. In the example in Fig. 3.6, within the capability group of "supports", we see five capabilities starting with "facility management." At the next level, these capabilities are decomposed into their sub-capabilities.

3.2.1.1 Producing a Capability Map

Capability maps are created by workshops where discussions on different capabilities are conducted and each capability is identified, defined, and placed on the capability map. Naturally, it would be easier to begin with a template (reference model) but regardless of such aids, it is important for the participants to discuss and agree on identified capabilities, their description and definition. Bear in mind that for a specific initiative change, there is no point in mapping all the capabilities of the company. That would take a long time and be unfeasible. The focus should be on, for the change initiatives, relevant capabilities and ensure that there is value of a capability model prior to starting to map or develop one. In developing a capability map, it is important to discuss and bear in mind the following points:

A capability is more stable and long lasting than a process. A capability is therefore not subjected to change. As a capability is "what" an organization does and not "how", "who", "where" or "when", it has the characteristics of being stable. Emailing is not a capability as it describes "how" something is done but "information management" is because it describes "what" an organization does. Furthermore, an organization with the capability of "business intelligence" will have this capability for quite a long time. It does not change. However, the way the organization carries out this capability will certainly evolve.

Capabilities have outcomes meaning that something is achieved. For instance, the capability of "accounting" has a clear outcome of producing correct financial reports whereas communicating financial reports is not a capability, as it does not have a clearly defined outcome. As such, capabilities have outcomes that are clearly defined. In doing so, the participants usually gain a common understanding of what their organization does. Another way to view this aspect is considering that capabilities are value driven. A capability, in essence, exists for the purpose of delivering value to the end customer. Different capabilities offer different degrees of value to the end customer. As such, as part of the modeling of the organization's

capabilities, one can mark capabilities (using color) according to the degree of value they offer to the end customer (high, medium or low value).

Capabilities are to be defined at a higher level of abstraction. As such, a capability should not be detailed or indicate movement (as a process does). "Customer order approval" is not at a sufficiently high level of abstraction but rather more at the level of what is done in a process. A sufficiently high level of abstraction might be "customer order management." The capability can be further refined in its sub-capabilities that are required to achieve its parent capability. "Customer order management" can be further refined into "Quote Generation" and "Solution Customization." These capabilities are required for the parent capability and are, therefore, sub-capabilities.

Capabilities are to be defined in business terms, as they are business capabilities. As such, a capability named IT management is an ok name whereas "database" management is not a business term. Furthermore, capabilities are to be expressed as nouns and not verbs. This follows from capabilities defining "what" and not "how".

Capabilities are unique and as such, cannot be duplicated. Each capability occurs only once in an organization's capability model. If two capabilities seem very similar, it's either one capability or there is a difference motivating having two capabilities. "Customer management" and "partner management" seem to do the same thing (what) but there might be a reason for keeping them separate. In discussing similarities and differences, it might emerge that the stakeholder being managed differs and that might be significant enough to separate them.

In discussions born from workshops, interviews or documents, the participants can gradually develop a capability model. There are no standard step-by-step methods to follow but rather, by adhering to what a capability is, participants will get a mutual understanding. Such common ground and viewing of the capabilities are sometimes one of the main outcomes of a capability modeling activity. The capability map can be modelled as described in the Fig. 3.6. However, it is possible to add dimensions to each capability by adding the dimension of impact to each capability. Impact refers to the impact of the capability on business value and/or customer value. In other words, it can also be seen as the importance of the capability in delivering business and customer value. Another dimension, the performance gap, is the difference between the performance of the capability as it is now, compared to the desired level. A capability that is performing well and is very close to the desired level, has very little or no performance gap. It might be relevant to include the risk level regarding the performance of the capability. These can then be incorporated in the model using color codes as the Fig. 3.7 depicts [37].

3.2.1.2 Usage

The capability model explains, independent of processes, organizational structures, departments, people, and geographical locations, what the business does in order to meet its objectives and responsibilities. On a higher level, it can function as a valuable input in discussions and decisions related to strategic issues of an

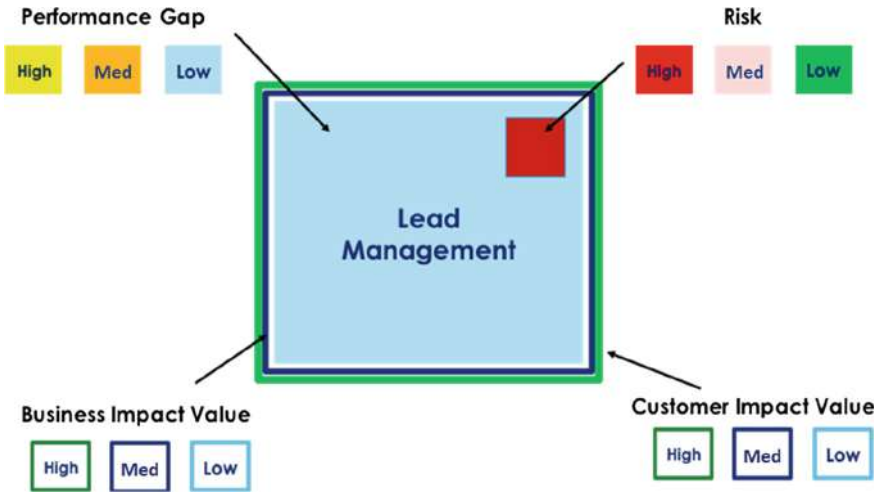

Fig. 3.7 Example of a capability depicting several dimensions (based on [3])

organization. When an organization has several alternative investment options, it might use the capability model as an input in determining which projects to prioritize. The input could be based on where capabilities need to be created, strengthened or developed as part of the portfolio management.

A business analyst will not get involved in producing a capability model (with very few exceptions) as it is time-consuming, resource-intensive and concerns the functioning of the whole organization and not only the problem at hand. If such a model has been produced previously, it is recommended that the analyst consult the model. However, it might be necessary for the analyst to consider or analyze the capabilities from the perspective of the specific issue being investigated. Let us assume that a company wants to introduce a new service to its customers. This service has three main components, taking orders from customers online, the management of the order and finally to ensure payments. In determining how to provide these services, the analyst might consider if the company is offering any services that are similar to the ones required for this new service. One way is for the analyst to ask around and see if anyone has a clue. This is naturally an ad hoc method that is somewhat unstructured and might not be comprehensive. Another way is to analyze the capabilities and perhaps the sub-capabilities required for offering the new service. The first component, taking orders online, requires the capability of "order management". This capability might be enabled by sub-capabilities of "product offering" and "online order management." Having defined these capabilities, the analyst can check with the organization's capability model to see if the organization has this capability. If the capability exists, then these capabilities are supported by processes and an information system, which can be re-used for the new service being offered. Another way would be to analyze the capability model and see if the current capabilities of the organization can be used

to offer the required components of the new service. In summary, considering the example in Fig. 3.7, capability models can also be useful for assessing if existing capabilities can be used for new solutions or to assess an organization's ability to offer new services.

3.2.2 Digital Capabilities

Incorporating digital solutions can require a new set of capabilities. Digital capabilities are commonly embedded in major capabilities. For instance, digital marketing is a subset of marketing capability. Some digital capabilities such as data analysis capabilities might be new for companies. A few illustrative capabilities are discussed here.

Data and analytical capability are a core capability for any company seeking to utilize digital technologies. Data capability encompasses the means to capture, store, and effectively use data to improve various aspects of a business. Such a capability also calls for analysis of data across organizational units. A related capability is data governance which ensures the quality and security of the data. The analysis is only as good as the input data [38]. Another key capability is digital media capability. Digital media capability includes the ability to create and manage digital content. This capability looks at targeting the "right" customers in the right places by using suitable media. Digitalization of business models has increased the need to innovate. As such, research and development within the context of digital innovation, is another important capability. Front-end innovation such as making products more digital and improving the digital channels must keep up with the fast-paced developments in the markets. On the back end, information systems must support changing demands [39].

Digital solutions are evolving at a fast pace. Companies need capability of strong project management to manage various projects to keep up or, even better, stay ahead. Project management capability concerns finding the right talents, processes for planning and executing projects, and ability to cope with the changes brought by the projects [40]. Large projects taking years are oftentimes replaced with a set of smaller scale projects. Such an approach reduces the risk of developing costly solutions that risk becoming outdated. The need for agile software development becomes more relevant, even for large companies.

Capability analysis deserves more attention in the work of the analyst, in particular when helping companies become more digitally oriented. Digital solutions require certain capabilities. If the capabilities are lacking, the solutions will not deliver value. For instance, if a company introduces a web shop but digital marketing capabilities, the value will be limited. Digital marketing capabilities include social media strategies, online advertisement, SEO, setting up, monitoring, and analyzing digital metrics such as conversion and churn rate, conducting A|B testing to improve revenues and much more. If these capabilities are not covered in the

analysis, the company will end up with just a web shop with few visitors. As such, the analysis work needs to consider capability analysis to ensure that the solution can be sustained.

3.3 Stakeholders

Stakeholders can be defined as different groups of people who have an interest in the organization. For instance, in a public trading company, the shareholders are the stakeholders. They are very interested in how the company is managed as this directly affects the profitability and the share price of the company. Different stakeholders have different interests in the company and as such, their agenda differs. Knowing more about the main stakeholders (on the company level) and what their interests (and influences) are can be helpful in both understanding problems and might be a valuable input when determining how to solve issues.

We have already mentioned the shareholders who seek a return on their capital. The shareholders are not aware of the issues but their demand for a good return on their investment, indirectly affects the evaluation of solutions, as issues need to be resolved in such a way as to deliver a return on the investment (financial return). This connection is very indirect but illustrates the influence. Other stakeholders might have a more direct influence.

Customers or clients, distributors, suppliers, regulatory agencies, and technology providers can also be stakeholders. Whilst we do not consider these services at the level of the specific issue, their general interest and influence on an organization can be valuable when discussing alternative solutions. In order to understand the stakeholders better, it is worth considering the following questions:

- Who are the main stakeholders (such as clients, customers, distributors or suppliers) that the organization is serving or collaborating with?
- What is their interest and how do they come into contact with the organization?
- What criteria (explicit or implicit) do they use to assess their contact/collaboration with the organization?
- What criteria does the organization use to assess collaboration with stakeholders?
- How does the organization know how well (or poorly) they are performing in this regard?

Take the case of an analyst working with an issue that indirectly involves suppliers and to some extent distributors. In such an instance, it might prove to be valuable to know how suppliers view their relationship and what criteria (on a higher level) they consider important. This input can be of value when the analyst is engaged in developing and evaluating alternative solutions to the issue. Perhaps there are service level agreements (SLA) that needs to be considered and complied with. As can be seen, while the stakeholders might not even be aware of a specific

issue being discussed, their view of successful collaboration with the organization might provide an indirect influence on how the final solution is solved and designed.

3.4 Organizational Culture and Structure

3.4.1 Organizational Culture

The culture of an organization is very hard to see or capture graphically. Organizational culture is the values, expectations, experiences, and philosophy of an organization. It is the self-image the organization has, and it expresses itself through shared attitudes, customs, praxis, and written or unwritten rules of how certain things are done. It is expressed by how they treat their employees, customers or their wider community. It may express itself in how decisions are taken, or if the organization approaches new ideas boldly or with caution. It expresses itself through how information flows and how employees dress, the latitude for differences, the attention given to parameters such as quality, customer care, and service or concern for the environment. It can also be whether the organization markets itself quietly, or boldly and provocatively, and how it works with improvement by implementing or rigorously following a systematic method (such as Six Sigma), or more on an ad hoc basis.

The culture can affect the business analyst's work in indirect and subtle ways. A company that has a culture of being very cautious might be more comfortable with solutions relying on well-tried and proved technologies as opposed to exciting new technologies. This might not be clearly stated in the discussions or in the interviews, but the analyst might find some form or resistance to certain technical solutions. It might be valuable for the analyst to understand the cultural background rather than trying to promote newer technology.

In understanding the organizational culture, it is not recommended that the analyst embarks on some form of "culture" analysis; rather, it is sufficient to be aware of the fact that certain aspects of the business analysis work might be affected by the culture. The analyst can, in his or her conversations with people from the organization, ask direct or indirect questions about the culture. It is very difficult to get a clear answer by asking questions such as "what is your culture?" as it is not something everyone explicitly is aware of or knows how to explain. It is better to take an indirect approach and ask questions about how things are usually conducted. In the case of old and well-tried versus new technology, the analyst might ask "how do you usually view new technologies?"

The extent to which the organizational culture is relevant to consider as a factor of influence depends on the issue at hand. If the issue being worked on is quite simple or limited in scope, such as replacing a system or digitalizing a paper-based process, it might not matter at all. However, if the issue might require changes in

the organizational structure or the way work is done, it might express itself. In such cases, the culture expresses itself through resistance or unfavorable views on certain aspects of the issue, such as, reluctance or biased evaluation of new technologies as was mentioned before.

3.4.2 Organizational Structure

Organizational structure defines how an organization has arranged its hierarchy, lines of authority, task allocation, roles, rights and responsibilities, and how information flows between different levels of management and departments. It captures how an organization has chosen to organize itself in order to function. The structure can take many different forms, the most common ones being the following:

- Functional structure – where each function, marketing, human resources, accounting, development, manufacturing has its own department.
- Divisional structure – where each division serves a specific set of customers or geographical area (markets).
- Product structure – where companies set up their structure based on different product lines (sometimes requiring different technical skills).
- Decentralized (team-based) structure – where companies organize themselves in teams with complementary skills working towards a common goal.
- Matrix structure – where companies structure along two dimensions such as products and divisions.

The analyst does not need to model the organizational structure. In almost every case, the company has already captured its organizational structure as an organizational chart. Organizational charts visually present the different departments (and their sub-departments) of a company together with different management functions. Organizational charts are represented using boxes (departments) and lines between the boxes to represent decision-making power.

3.4.2.1 Internal Policies

Larger organizations have a set of documented rules or guidelines that define policies. Although they may differ, depending on the company, they define the overall organizational policy statements that give guidelines on personal behavior in the workplace. Another set of policies could be operating practices and procedures that define policies on how expense accounts are to be used, reported and monitored. In the context of business analysis work, the overall policies concerning the whole organization are not of primary interest.

It is highly likely that policies or rather procedures defining operating practices might affect the business analysis work or the selection of the solution. An example of this would be an organization that has many rooms and uses a company system for booking meeting rooms. This system is not flexible and does not allow for easy viewing of available rooms and cannot display different features of the rooms, such as, seating capacity and technical equipment available. The process of booking the room is either by email or visiting the secretary. This booking system is unacceptable, as it is unable to give information about availability and other important details. In the event of the secretary being out of the office or if the intended room is already booked, it can take up to half a day to secure a room booking. One alternative solution might be to enhance the functionality of the current system hosting this service. Another option might be to build a user-friendly interface to the system and yet another option might be to buy/subscribe to a SaaS solution. If there is a policy in place stating that all administrative services are to be in one system, due to keeping costs and a number of systems low, then the third alternative will simply not be a viable solution unless the policy is changed. In this way, certain policies can affect the solution.

Some organizations, again particularly larger ones, have defined how new investments are to be made and how projects are to be delivered. These measures are often taken to standardize development processes to gain efficiencies and streamline the processes. This affects the business analysis work. For instance, the internal policy of a company might state how the current state is to be described or what techniques are to be used as a minimum. Furthermore, the policies might define on what basis (results) decisions are to be taken. This affects the analyst, not so much on what solution is chosen but how the analysis is conducted and what kind of documentation is required. Figure 3.8 illustrates the internal policy on how a feasibility study and projects are managed within the organization, defining for instance results and decision points.

As can be seen from Fig. 3.8, this organization has five aspects of the development. The main one is the “process” that is to deliver “results”. The results are reviewed and based on the reviews, decisions are taken to either move forward, redo or cancel. Finally, there is “planning and follow up”. The process begins with an investigation (feasibility study that is mostly business analysis work) followed by an establishing project, which means deepening the feasibility study. Following this step, if the decision is taken to continue, the solution is detailed. On the other hand, consider if the company has adopted an agile method. The pre-analysis, quality assessments and decisions taken will follow a different structure and process. In such cases, the internal policy is different. In short, the internal policies or the way the organization has chosen to structure its development process and the decisions alongside with it affects the business analysis work and how the business analyst conducts his or her work. As such it is important for the analyst to be well acquainted with these internal policies.

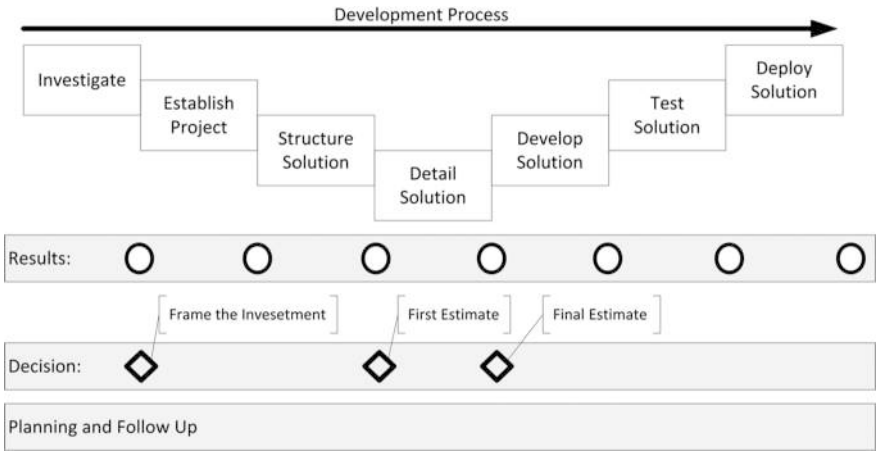

Fig. 3.8 Example of internal policy for development process

3.5 SWOT Analysis

The PEST analysis and Porter's five forces analyzed the external environment while business model canvas, stakeholders, and policies focused on the internal environment of an organization. A model that combines these two is the SWOT analysis. SWOT stands for "strengths", "weaknesses", "opportunities" and "threats."

The strength and the weaknesses concern the internal environment of the company [17, 41]. Strengths are the resources and capabilities of an organization that can be used for developing a stronger competitive advantage. A patent, strong brand name, automated processes that gives a lower cost structure, or distribution channels are examples of strengths. In short, strengths are anything that an organization does well. Weaknesses are things that are either done poorly or not at all. It could be a lack of resources such as weak brand name, expensive and complex IT structure, a lack of skilled human resources, weak R&D or long time to market. Sometimes weaknesses and strengths can be the opposite of each other. For instance, consider a manufacturing firm that has a large capacity, which gives them an advantage against other competitors. However, at the same time, depending on the industry they are active in, it could be a weakness if the large capacity is limiting flexibility to respond to market changes.

Opportunities are external factors that could be taken advantage of for the purpose of gaining competitive advantage and profit. It could be a market segment where customer needs are unfulfilled, new technology, de-regulations, new markets or new products. Conversely, threats are external factors that can affect the advantage or profit of a company. Examples of threats could be shifts in customers'

preferences, new competitors entering the market, reduced growth of a market or new regulations.

SWOT analysis is a very simple tool that has many uses such as for developing strategies, evaluating the current situation of an organization, a division, or of a business unit. SWOT analysis provides a general or high-level picture and needs to be further detailed if it is going to be used as the basis for decisions (see Fig. 3.9). Therefore, it is important to have a specific context of focus when conducting such an analysis. Lacking such a focus will result in identifying factors that are not relevant to the task in hand.

SWOT analysis is also particularly good for identifying change opportunities when there are no immediate needs or issues that must be solved. If a company (or a department within a company) wishes to improve its business but is under no immediate threat of issues or problems, SWOT analysis can be used to find change initiatives that allow the company to find something that both utilizes the opportunities existing outside of the company combined with their internal capabilities. For example, supermarkets possess large parking areas that are rarely used to their maximum capacity, particularly when the store is closed. Supermarkets usually have low margins and therefore, volume is important. Let us consider such a company trying to find opportunities to increase their revenues. Let us assume they bring in a business analyst to help them. One of the activities might be a SWOT analysis. In discussions with stakeholders, the following aspects emerge.

The supermarket has a very good location as it is in a residential area. Due to their long presence in the area, they have ample parking space. Furthermore, the area has been growing fast over the past years and many new apartment buildings are being built. The parking prices have increased. The supermarket does not have many analytical or developmental capabilities but on the other hand, there is the growth of mobile apps, and vendors specializing in app development have grown. Let us make a SWOT analysis.

As can be seen in Fig. 3.10, the SWOT analysis allows the company to identify change initiatives. In this case, the supermarket might have realized that they can rent out their excess parking space at certain hours. They can apply several methods. They can limit free parking to two hours, allowing those who are customers to park for free while others pay. They can also introduce "gates" where

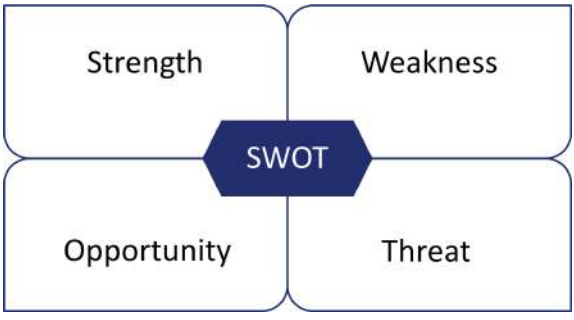

Fig. 3.9 SWOT analysis

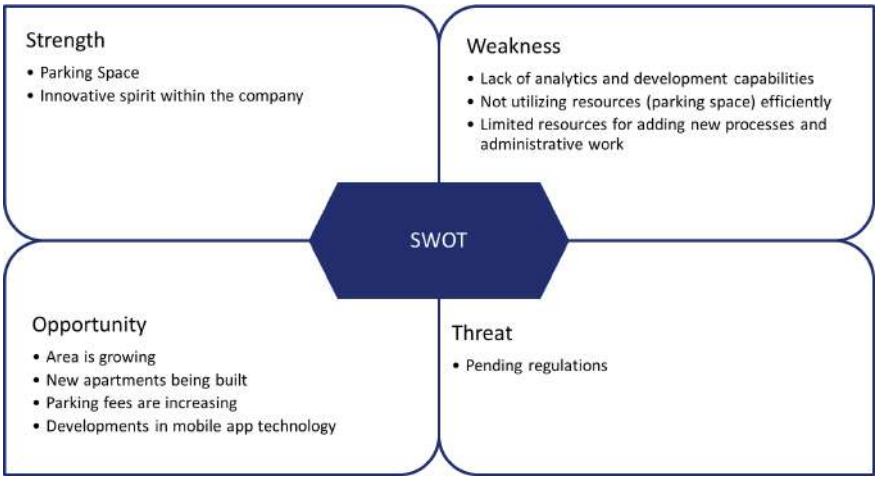

Fig. 3.10 SWOT analysis of supermarket parking case

customers take a card and when leaving, have to pay if they have stayed over two hours. While these are possible solutions, they do not want to create barriers for customers or any extra administration. Therefore, they decide outsource the development and maintenance to a mobile app development company. They can choose not to check that all cars have paid (as the cost of checking exceeds the fines) or they can outsource this part to those living nearby. In any case, the SWOT analysis can be helpful in identifying change initiatives when there are no immediate issues to resolve.

Chapter 4
Strategic Business Analysis and Monitoring

Business Analysts working at higher levels will commonly not engage in analysis of individual change initiatives. Strategic business analysts will focus on a collection or portfolios of change initiatives. Furthermore, they will commonly seek to improve processes related to business analysis and the business analysis work itself. As such, they work with Business Analysis Governance and Business Analysis Performance Improvements. While governance and performance improvements are addressed when the need arises, portfolio management is frequently visited. The strategic business analyst must also, when considering the portfolio, have a finger on the pulse of digital technologies. The analyst should be aware of emerging technologies, maturing ones, and how they are being used to create value for the organization. Such awareness is then incorporated in the portfolio management process.

The PEST, capability, and SWOT analysis will most likely lead to identification of potential change initiatives. However, not all can be done at once and hence, they are managed as a portfolio. A portfolio is simply a collection of initiatives, projects, and/or programs grouped together according to different parameters. A change initiative is changes that the company is considering doing but has not yet begun implementing. Projects, instead, are ongoing while programs are a set of initiatives and/or projects that collectively aim at achieving a common and sometimes larger objective. As such, a portfolio may include items that are planned, ongoing, and almost completed. The different items in a portfolio might have internal connections and inter-dependencies but they can also be completely independent of each other.

Portfolio management, on the other hand, serves to facilitate planning across different initiatives, projects, and programs to achieve specific strategic business objectives [42, 43]. At this strategic level, it is important to manage the portfolio, i.e., to effectively assess, determine, and coordinate the projects so as to optimize the use or resources in the quest of achieving the strategic objectives.

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4.1 Essence of Portfolio Management

A large company with several business units might have one portfolio per unit, comprising items that collectively will enable achieving the strategic business objectives. Another unit will have a different portfolio for the same purpose. Within one unit, portfolio management means looking at the items, assessing their value delivery, risk, necessity, gaps (to add new initiatives), modifying, or even removing existing projects. A portfolio is therefore dynamic and constantly adapted and modified. It does not have a time boundary or an end date and is strongly linked and aligned with the corporate strategy. Portfolio management rests on the assumption that the different initiatives, projects, and/or programs compete for the same resources. If there had been no overlap for such resources, such as human or financial, all projects that had a positive return on the investment would have been implemented. The fact that resources are limited, forces organizations to wisely determine which project to prioritize over others.

The purpose of portfolio management is exactly that, to do the "right" project. The "right" project is not always easy to determine. The "right" project might change as circumstances and the context change. However, portfolio management serves to identify the "right" project for the following reasons.

Alignment to strategic objectives: Essentially all projects included in a portfolio should be relevant for achieving the strategic objectives, but different projects improve different aspects of the business. At times, certain aspects of a business have a higher priority over others.

Optimizing resource: As financial and human resources are limited, it is important to ensure that they are being used effectively.

Balance: All initiatives, projects, and programs do not deliver value in the same way or to the same "part" of the business unit. Some projects improve product offering, while others improve internal operations. A balanced portfolio is naturally preferred to an unbalanced one. A balanced portfolio will have a better potential to achieve the objectives. As such, considering how and where projects deliver value is another relevant aspect.

Agility: The external and internal context is dynamic. The portfolio needs also to be dynamic, agile and adapt, stay relevant, and aligned with the strategy. In order to ensure that new opportunities can be exploited and focused on relevant projects, one needs to consider this aspect as well.

The above listed points capture the main purposes of portfolio management. Let us assume that two different companies are competitors, and both provide music streaming services. Both will have a portfolio to manage. One of them focuses on streaming songs published by the music industry while the other focuses on less known or unknown artists. Both companies offer music streaming but have different business models, target different customer segments, and different value proposition s. The right project for one is probably not the right project for the other company. Nevertheless, both manage their portfolios of projects as both wish to align their

projects to strategic objectives, optimize resources, balance the mix of projects, and adapt to changes in their contexts.

Project management is a domain in itself and the Project Management Institute (PMI) has published "The Standard for Portfolio Management" [42], focusing on accepted practices of strategic, governance, performance, communication, and risk management for portfolios. However, not all companies will have dedicated portfolio managements, and if such roles exist, the business analyst will be engaged with some form or portfolio management. Although there are different processes, ideas, theories of how portfolio management should be done and what it should include, most of them capture a set of core elements. We will consider the core aspects of portfolio management as it can become valuable to a business analyst.

4.2 Portfolio Management Process

A portfolio contains mostly a set of projects that are planned and are ongoing. The process by which projects are managed in a portfolio follows a life cycle. It is important to note that the portfolio will continuously have the strategic objectives of the company as input. The projects are born (generated) of the external and internal business context. All projects in a portfolio have to be aligned with the context to ensure that only the "right" projects are included in the portfolio. Once projects are identified, they are analyzed followed by an assessment. The analysis aim is determining the importance of the projects, whereas the assessment considers prioritization and when to initiate the project. Once the projects have been initiated, they are monitored. At any given time, there will probably be some projects that are being generated, analyzed, assessed, and monitored. All through this process, there is constant analysis and evaluation to ensure that the portfolio is balanced, relevant and up to date (see Fig. 4.1). It should be noted

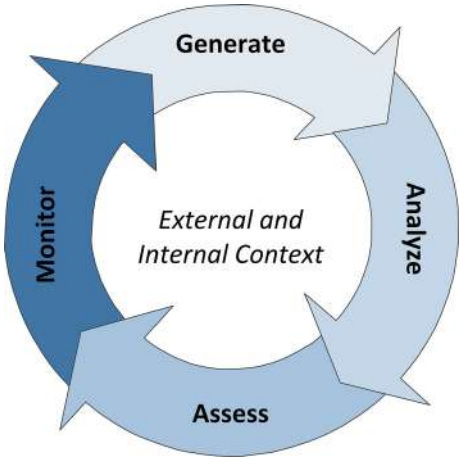

Fig. 4.1 Portfolio management flow

that portfolio management does not strictly follow a specific process but rather follows a more iterative and dynamic flow.

The generation of projects concerns primarily identifying projects that would take the organization a step closer to its strategic objectives. Generation of projects encompasses collection of data where input from both external and internal context is gathered and analyzed. One should bear in mind that planned projects have not necessarily been investigated yet (business analysis work) and therefore, managing the portfolio is done based on very high-level information. This is not a problem because the focus is on the portfolio and not on the individual projects. Naturally the analysis will deal with the projects but mainly as a collective set of projects. One of the ways this can be facilitated is by categorizing the projects. The portfolio covers different aspects of a company and different projects aim at bringing the organization closer to different strategic objectives. Therefore, all projects are not comparable with each other. Categorizing them according to different parameters, allows for managing comparable projects collectively. The most common way is to plot the projects in quadrants with two parameters. Projects can be categorized according to expected value (net benefit) and probability of success (risk). The projects can also be analyzed in terms of where in the process of the idea, how fully implemented they are, and the strategic importance of the value that is hoped to be achieved versus feasibility of the project (complexity).

The aim of analysis (often by means of categorization) is to facilitate the analysis and enable the decision makers to make as informed an assessment as possible. Assessment has two aspects. The first is to assess the composition of the portfolio to ensure that it is up to date, aligned with the context, will achieve the strategic objectives of the organization, and that the "right" projects are considered. Such assessments are made ongoing and every time a new need or project is introduced, it is analyzed and assessed in relation to the other projects. However, organizations do not have unlimited resources. The best method to manage limited resource availability is by prioritization.

This is the second aspect of assessment, namely selection of which projects to implement. In taking such decisions, all the inputs from the analysis phase are considered. Analysis serves also to assist in this process by filtering out projects that are not worth pursuing. Consider a portfolio of projects analyzed according to expected value and risk (measured as probability of success). If the projects are plotted in a quadrant, it becomes quite clear that projects with low expected value and low probability of success are to be discarded or avoided. The decision on which projects to implement will vary between organizations and the project type. An organization that is permeated with a cost-driven philosophy will focus on projects that reduce costs, whereas value-driven companies will prioritize differently. The same principle applies to project types. Regulatory demands are not prioritized the same way as entering new markets, cost-reducing, or optimization projects. However, most prioritizing decisions will consider similar aspects such as the following:

- **Value delivery**: The value that different projects deliver will vary and that is considered as well when managing a portfolio.
- **Restrictions and limitations**: There might be temporary or long-lasting restrictions that affect which projects can be done. For instance, the financial situation of the company might be stressed and therefore, larger projects are avoided for a while.
- **Investment time frame**: Different projects have varying time frames ranging from short, medium to long term investment horizon. The shorter the time frame, the sooner can the expected value be realized for less risk. Long term projects inherently carry higher degree of uncertainty and as such, it might be a parameter to consider.
- **Alignment with other projects**: Some projects might have a dependency on deliverables of other projects. There might be a need to consider sequentiality of projects. Furthermore, in determining what is the "right" project, it is relevant to consider other projects that are about to start, are ongoing, or are being finished.
- **Complexity**: Another aspect to consider is the complexity of the projects or in other words, the degree of difficulty or risk associated with delivering the solution.
- **Pipeline of projects**: As several projects are oftentimes ongoing concurrently, some at the analysis stage, others in design or in delivery, while others are about to conclude, it is important to consider the pipeline and the timing of the projects. This aspect of planning enables a continuous flow of projects to ensure that when a project concludes, there are one or several new ones beginning.

Project portfolio management also includes monitoring of the portfolio. This can include the progress and relevant aspects of ongoing projects but is not restricted to this only. The portfolio can be monitored and reviewed periodically as part of the work of keeping it optimized. Different organizations can use different metrics by which they monitor the performance. For instance, quantitative metrics such as total return on investment can be used in the monitoring and review process. In this work, it is useful to have performance indicators that are applied for periodic reviews of the portfolio performance. Although the portfolio is being reviewed, the status of ongoing projects, significant delays and changes are also considered due to the effect it can have on the portfolio and on other projects in the pipeline. In the end, the monitoring of the portfolio serves to ensure that it fulfils its purposes as stated earlier.

Product portfolio management can become advanced and difficult when the number of projects increases. These tools help with visualizing the portfolio of projects, assist with resourcing planning, allow for data to be captured about the projects and thus analyze the portfolio from different perspectives to help with the analysis, assessment, and monitoring of the portfolio.

A final note on this matter. Business analysts are not often involved with corporate strategies but rather with projects that realize the objectives of a company. Nevertheless, an analyst needs to understand the strategies as these constitute the context within which improvements are made. Consider a simple project of

supporting management of customer relationship. The analysis of the problem and the solution will depend on what kind of business model the company has, particularly if the company considers its customer relationship as a competitive advantage or if it seeks to reduce its costs. The former would perhaps focus on face-to-face solutions whereas the latter on self-service. In light of this, the analyst is benefited from having the context in mind. There are many tools and methods for conceptualizing and representing different aspects of the business context. The ones presented here are perhaps the most well-known. Although they primarily aim at being a basis for high level assessments, they are helpful for an analyst to gain an overview of the business context.

4.3 Plan Business Analysis Governance

A business analyst will be engaged in eliciting and unraveling many facts and analyze fairly large amounts of data and information. This process is replete with decisions. Decisions can be of different kinds but will have an impact on stakeholders (to various degrees). The analyst cannot take these decisions. We must not forget that the analyst has an "advisory role" with the "responsibility for investigating and analyzing business situations, identifying and evaluating options for improving business systems, elaborating and defining requirements, and ensuring the effective implementation and use of information systems in line with the needs of the business" [1]. Therefore, the analyst advises but does not take decisions. It should be noted that the decisions referred to are those pertaining to issues that affect the business (such as resource allocation) or the solution (such as requirements).

As such, it is important to have an understanding about how different types of decisions, reviews, approvals, changes, and requests are clarified and defined. It is important for the analyst to know where to turn to for certain decisions, who the decision makers are and how decisions are taken and documented. The business analysis governance plan simply "identifies the stakeholders who will have the responsibility and authority to make decisions about business analysis work including who will be responsible for setting priorities and who will approve changes to business analysis information. It also defines the process that will be utilized to manage requirement and design changes across the initiative" [3]. Ideally, the business analysis governance plan covers the (1) decisions, (2) managing changes, (3) prioritizing process, and (4) the approval plan.

4.3.1 Decisions

In the process of planning the business analysis governance, the analyst will most likely consider the following questions:

- What kinds of decisions are required? There are different types of decisions that need to be taken. For instance, certain decisions pertain to providing the project with resources while others concern the actual solution (such as requirements and design). An organization might also have decision points embedded in their internal processes such as internal reviews. The internal reviews can serve to approve the business analysis approach to secure that the required resources are available. If the organization is large, there might also be requirements to review the solutions from the perspective of architecture, compliance with the overall IT strategy, that risk assessment, or verification that required deliverables are adequately addressed.
- Who are the decision makers and for what kind of questions do they take decisions? Most often, different types of questions are referred to different decision makers. For instance, a question concerning resource conflicts requires the involvement of the manager(s) of the resources whereas a decision to hire additional resources might require financial approval from higher up in the organizational chart.
- Who to turn to for decisions depending on the level of granularity? If a decision is related to general principles of a solution, it will be valuable to involve the managers who will receive the end solution. However, if the question concerns choosing between two alternatives on a detailed level of the solution, perhaps it is more relevant for the subject matter experts or the end-users to be involved in the decision.
- How are decisions documented and communicated? If decisions need to be documented, how are they documented? Another aspect to consider is how decisions are formally taken (for instance signatures on what kind of documents) and how they are communicated to relevant parties? Oftentimes, the decision needs to be signed by several persons, in particular, if it concerns funds of larger amounts.

It should be noted that a stakeholder might have different roles in the decision-making process. It is possible that a certain stakeholder can be both the participant in a discussion meeting on a certain decision and also the reviewer who has to ensure that the results produced are of adequate quality and not lacking important aspects. Another stakeholder might be a subject matter expert and advisor to a manager who is to approve the decisions made by the project group. Regardless of the possible combinations of stakeholders and decision-making roles, the key is to have a clear understanding of the decision-making processes so as to know where to turn for what kind of issues and ensure a smooth progression of the work.

4.3.2 Managing Changes and Prioritization

During the execution of a project or initiative, changes will occur that need to be decided. An analyst might find that the scope of the investigation needs to be enhanced or reduced, or that an already decided solution needs to be changed. It is

important to have a clear understanding of how such decisions are to be taken and that these decisions can be taken smoothly so as not to delay the analysis work.

The analyst may wish to gain clarity about established processes for requesting changes or if changes are to be approved if they exceed a certain threshold (such as size, cost or effort). Much will be gained if changes can be dealt with quickly.

To assist the decision makers, it is good to have an understanding of what kind of information about the change should be conveyed. For instance, it is important to have a clear understanding as to why the change is being requested and its benefits. Changes are made to bring some form of added value and as such, these financial and/or tactical benefits should be elaborated.

It is also useful to clarify, for each change request, the estimated cost and time of the change. It might also be valuable to have an understanding of how the change will impact the overall initiative. Some changes might mean higher cost whereas other changes such as restricting the scope, might reduce the overall time and cost of the initiative. The risk of the change in relation to the initiative, the solution or the business objectives should also be discussed and mentioned. Another important aspect is the priority of the change. It might be possible that there are several different ways of how change can be made, and each alternative has its own implications in regard to time, cost, and quality. In such cases, it is valuable for the decision makers to be aware of the alternatives and the recommended alternative.

Any given initiative will exist within an environment with restrictions and constraints such as timelines, dependencies, resources, funds, and other initiatives. Such restrictions and constraints force decision makers to prioritize and it is valuable to have an understanding of how and who is involved in decisions concerning prioritization.

4.3.3 The Approval Plan

The analyst will produce many results, which need to be approved. In certain industries such as healthcare which is heavily regulated, the need for more frequent approvals is higher as compared to other less regulated industries. The approval plan will have to consider this aspect. Furthermore, there might already be policies regulating approvals within the organization. In such cases, these need to be respected and followed. However, that does not prevent the analyst from introducing additional approvals if the initiative will benefit from it. Another factor that might affect the choice of design of approvals (such as frequency, formality, involved decision makers) is the size and complexity of the initiative. It follows naturally that larger and more complex initiatives will benefit from additional approvals as compared to smaller and simpler ones.

The approval serves to verify the quality of the work produced by having a formal verification that the results are described with sufficient level of detail, are accurate and adequate. Such approvals also serve to satisfy the stakeholders and decision makers that their decisions are based on a good foundation.

The analyst will be greatly assisted by having a clear understanding of the approval plan that is aligned with the internal policies, needs of the initiative, industry, the ability and interest of the stakeholders to take part in different kinds of approvals. A word of caution is in place. The approval adds value by ensuring quality but if taken too far, approvals will slow the process, cause delays, become bureaucratic, and lose its purpose and become costly.

4.3.4 Example of Governance Policy of a Company

Now, we will take a closer look at an example, inspired by a real case, of how a company has structured their governance policy to create a standard for initiatives and projects.

In Fig. 4.2, we see that the company has chosen to divide all of the projects into six main stages. Different companies will naturally have differences in how they define the stages in their industries and ways of working with projects will differ. However, in the example here we see that there are deliverables to be produced at the end of each stage. This, however, does not limit the analyst to add or break down those deliverables into several minor deliverables. In fact, as we discussed previously, this should be done.

We can also see that at the completion of each stage, there is an approval and review instance. The deliverables are to be reviewed and approved. The reviews might vary between stages. For instance, at the end of the first stage, the review might concern the contents of the deliverables or their quality. However, as the solution is being more crystallized, additional reviews might be introduced. As was mentioned before, there might be a review of how well the solution complies with the overall IT strategy of the company.

Furthermore, at the end of each stage, there is a main decision point. At these decision meetings, all the inputs of the deliverables, reviews and approvals are taken

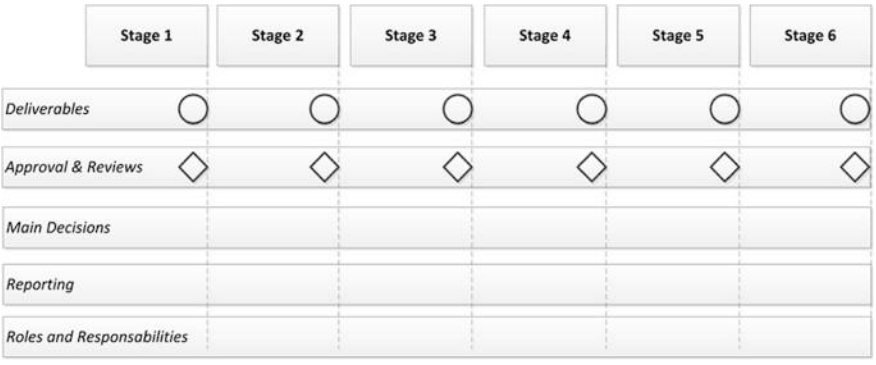

Fig. 4.2 Example of governance policy (inspired by a real-life case)

into consideration, the plans for the next stage are viewed and based on the information at hand, a decision is taken either to proceed with the next stage, to re-do some of the work of the current stage, to hold or even to cancel the initiative or project.

Reporting, in this case, refers to the minimal requirement of reporting the on-going progress and results of the work done to pre-defined stakeholders. The frequency, the rules and the contents of the reports are defined in the documentation and the analyst will manage these requirements.

Finally, the roles and responsibilities of those involved are defined for each stage. In this particular case, the governance model is accompanied by a manual with further explanations. In these explanations one can read what are the roles and responsibilities of various stakeholders, such as the manager receiving the solution, and the analysts.

Figure 4.2 with its accompanying documentation constitutes the "way" initiatives and projects are managed in this company. From the illustration, it is clear that the company has chosen a more predictive approach. However, one will find quite many similarities in regard to governance with adaptive approaches. Their order and frequency are different but in essence, the same things are required. Adaptive approaches such as "scrum", also require approvals, decisions, and reviews. They are just placed in different places in the process, the roles have different names and the time cycles are different.

4.4 Identify Business Analysis Performance Improvements

As with any other profession, companies want their business analysis work to improve with each concluded project. But how can the business analysis work be improved? How can it be measured or objectively assessed to see if it is improving? What could be done to improve the business analysis work and where should measures be set in order to make improvements? To answer these questions and to consciously work with continuously improving the business analysis work, we need to have measures. For this purpose, we want to identify business analysis performance improvements i.e., assess the work and to make plans to improve where opportunities arise. Please note that the assessment and the improvement are not only for the next project but also for within one project.

4.4.1 Need for Measures

For improvement, we need and establish performance measures to monitor. It is not so simple as just giving a list of measures to follow and certain questions to ask at the end of each project. Effective business analysis work will depend on both the

context of the organization and the nature of the project or initiative. In an organization where stability is the priority, where changes need to be tested and re-tested, the focus is perhaps more on correctness. Good business analysis work might mean quality. Another organization might have an innovative culture where new product launches are rewarded. In such cases, speed triumphs quality and good business analysis work is measured accordingly. For a certain type of project such as compliance with new regulations, perhaps measures such as time and cost are relevant. On the other hand, enhancing a product with new features due to competitors offering the feature might be more time critical making time related measures more relevant. In short, what constitutes good business analysis work depends on the context and the project.

In some organizations, certain measures have been defined as standard. In such cases, the analyst will use them. However, that does not limit the analyst from developing or using additional measures for improving the work. Performance measures can take many forms. They can be based on "time" such as planned versus actual time for completion of tasks, meeting deliverable deadlines or other major or minor milestones defined in the business analysis plan. Other measures can be a number of changes in the requirements, re-work or test-related measures. These are all examples of quantitative measures that are objectively measurable. However, measures can also be of a qualitative nature. Feedback from customers or other internal and external stakeholders can be used to assess the performance. For such measures, surveys, questionnaires or interviews with key people can be used.

It should be noted that we are not talking about measures to assess the efficiency of the solution. That will come later. For now, we are concerned with measures to assess efficiency or quality of business analysis. When designing or choosing measures, one should bear in mind that measures can enhance or encourage certain behaviors and discourage others. When a time related measure is used, and the process assessed is based on it there is an implicit incentive to be fast but not thorough. Tasks are delivered on time, or even before the deadline, but the quality suffers. In the end, this does not help the organization but rather will inflict more harm.

4.4.2 Developing Measures

When considering measures, it is important to start with the objective of the measure, i.e., what is it that we want to assess? It might be the completeness of requirements, perhaps quality of analysis, or fit between problem/need and solution. It could be methods used for defining current state, analyzing problems or defining requirements. Once the objective is clarified, it is important to consider what the question is that we want to have answered. If we aim at assessing the efficiency of a method, what is it we want to know? Is it how efficient it is to use in terms of "time" or perhaps we wish to assess its efficiency from the perspective of "usability." Finally, when we know the objective and the question, we can find the best

measure/s for it. If the efficiency of a method used for defining requirements is the objective from the perspective of time, we can then use a measure such as "time per requirement."

Some other possible measures are as follows:

- **Strategic**: The analysis work, at the end of the day, must serve to bring about a change that resolves a problem, need or capitalizes on an opportunity. If the analysis work fails to do so, it needs to be improved. Strategic measures are those referring to how well business objectives are met, how well problems are solved, and improvements achieved. It does not concern the actual efficiency of the solution per se. Given the context, it looks at whether the analysis work identified and recommended was the best solution. For instance, consider an inefficient process in need of re-design. The analysis work might have recommended an automation of the process but neglected or missed to re-design the process for gaining, even more, benefits. Perhaps it was re-designed but not as good as it could have been. If this is the case, then there is room for improvement and measures to take to avoid repeating the same in future projects.
- **Relevance or value**: This measure serves the objective of assessing the value or relevance of the results produced during the analysis work. During the analysis work, time, money and resources are spent on generating information. If the information created is of no use in the work, it simply will be a waste of time, money and resources. It is, therefore, important to know if the results have an actual value i.e., are they used in later stages or did it become a paper product.
- **Accuracy and completeness**: Measures to assess how well the analysis work produces the correct and relevant results or whether several iterations are required before stakeholders agree and accept the contents. If the analysis work is efficient, it manages to understand the facts and result in good analysis, thereby making it accurate, complete and relevant. However, if there is something wrong or room for improvement, one might see that a certain result, such as defining the current state, is revisited several times and stakeholders make several iterations before approving the contents. If that be the case, there is probably something that can be improved. However, it might depend on the problem. If the problem is very complex and the stakeholder has not a good overview, several iterations will be needed. In short, the nature of the project needs to be considered as well.
- **Knowledge and skills**: Another set of measures can be directed towards assessing the degree to which the analyst is equipped with knowledge, experience, and skills required for the task at hand. Not all projects are the same and not all analysts are appropriate for all types of projects. Assigning a junior analyst to a complex project is not optimal. To ensure the right fit between analyst and project is an improvement that will save the organization time, money and resources.
- **Time**: As mentioned before, a set of measures that focuses on the time perspective.

- **Organizational support**: The analysis work can only do so much. If the organization is not supportive, there will simply be problems. For instance, an analyst might need access to certain resources or subject matter experts. If the managers do not release them because of engagement in other projects, there is an organizational issue of prioritization that can be avoided in the next project.

4.4.3 Analyze the Performance

Once the measures are defined and the data gathered, the performance can be assessed and analyzed. The analysis can be performed from different perspectives such as from the customer perspective, the receiving department of the solution or other stakeholders. One should not forget that the assessment and analysis are done for the purpose of incrementally improving the analysis work. The idea is to constantly work with improvement and not to "punish" or find persons to blame when things did not go as expected.

As the main objective is to improve the next stages of the work or the next project, it is important to identify and recommend actions for improvements. As such, assessments are not only done after the project is concluded but it is essential to constantly have evaluations and assessments during the business analysis process. The suggestion for improvement varies depending on the situation and the project. Some suggestions might be very specific and concern the next stage or stages of the analysis work. Preventive suggestions aim at reducing the likelihood of events that will have a negative impact. Such as, that the event has not taken place but might become a reality if left unattended. These suggestions are more relevant and occurring during a project. Similar to preventive suggestions are corrective actions. Corrective actions come into play when an event with negative impact has taken place and we want to reduce the negative impact.

At the conclusion of the project, an assessment is performed. At such analysis, the focus will be more general and focus on what can be done to make the next project better. It contributes to the accumulated "lessons learned".

Chapter 5
Elicitation and Collaboration

During every phase or step of the business analysis process, the analyst elicits data and facts from a variety of sources. Note the use of the word "elicit" and not gather, collect or identify. Elicit is defined as "evoke or draw out". The information is not just sitting there to be picked up by any random analyst. Elicitation is about drawing out relevant information from stakeholders or any other source. Digital technologies have enabled elicitation and collaboration to take place independent of time and location. The digital analyst can and should use such tools, not only to make the elicitation and collaboration more effective, but to reach stakeholders in new ways and gain deeper insights. In addition, such tools can be embedded in many solutions, allowing for better value creation.

At the heart of the business analysis work is the discovery of facts and information that is used to understand, define and design solutions to solve particular issues or address needs. In all the interactions of the analyst with other stakeholders, there is some degree of elicitation occurring. As such, elicitation is not a step or a phase but inseparable from the work. It continues for as long as the analyst is working on an issue. It might be a planned elicitation activity where the analyst has prepared when, how, and what to discuss with who but it can also be unplanned (through conversations occurring between involved parties). In fact, it is not uncommon for stakeholders to freely discuss a specific matter from which a consensus of a solution evolves.

Facts, information, and data can be elicited in many different ways and there are quite a number of tools, techniques and methods for this very purpose. Regardless of which tools, techniques or methods are used, elicitation has four main steps [3]. As presented in Fig. 5.1, these are (1) prepare elicitation, (2) conduct elicitation, (3) confirm results, and (4) communicate results.

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Fig. 5.1 Elicitation process

5.1 Prepare Elicitation

The main purpose of "prepare elicitation" is to make sure that the conditions for successful elicitation are in place. In order to ensure a good foundation for the elicitation, the preparation should consider the following aspects (not necessarily in the order presented):

1. **Clarification and definition of the outcome and scope of the elicitation activity**: The elicitation will be much more efficient if the expected outcomes are clarified and defined beforehand. This does not necessarily mean that it is set in stone and unchangeable. It means that the expected results are discussed and agreed upon. Consider an analyst who wants to understand the current state from the perspective of its business processes. In his or her preparation, it is important to state the outcome of the activity, such as a business process model. Alongside the outcome, the analyst should understand the scope of the elicitation. In the example above, the scope would consider a high-level business process, further detailed where tasks, resources, and artifacts are represented. Furthermore, the scope would consider where the business process should start and end, or the boundaries of the business process being examined. Although the "start" and the "end" of the business process are discussed in the scope, it does not limit the analyst from modifying the process if compelling reasons emerge during the elicitation. The scope will help the analyst and the other participants to keep focus. Furthermore, it will also assist in identifying which stakeholders are to be invited.
2. **Determining the techniques, tools and methods to use**: Several techniques are used in combination to elicit information, and each technique has its strong aspects and limitations. By combining them, they become complementary. Selecting the most appropriate techniques is very important. With the right one, results are more easily elicited. If chosen badly, the technique can become an obstacle rather than a tool. As the elicitation commences, the analyst might change techniques. The analyst should adapt to the changing dynamics of the situation. In other words, the more techniques the analyst is familiar with, the more tools he or she has in his or her toolbox. When selecting techniques, the following aspects should be considered.

   – Time and/or cost restraints: The initiative might be under certain restrictions that will affect the choice of technique. Some techniques might be better if there is a constraint on time or cost as compared to other techniques.

- The stakeholders: The familiarity of the stakeholders with a certain technique (it being used widely in the organization as compared to a technique not used) is a factor to consider. Usually, the more participants are familiar with a technique, the more efficient it will be. Note that this does not mean that previously unused techniques cannot be used. The availability and the physical location of the stakeholders might also be valuable parameters. The physical location (all stakeholders being in the same room or physically located in different places) might affect how certain techniques can be applied.
- The initiative/project: When selecting a technique, the analyst will also consider which techniques are commonly used in similar initiatives, both within and outside of the organization.
- Preparation needed: A technique might be very good for a certain elicitation activity but require quite advanced preparation, set up and execution. Therefore, it is worth considering if the value of the "rightness" of the technique outweighs the extra work required. Perhaps another technique will give adequate results but at a much more convenient level of work.

3. **Practical aspect**: For every elicitation work, there needs to be some preparatory work that has a more practical orientation. Not only does this concern time, invitations, location, materials needed and required for the elicitation, creating an agenda, communication channels or even language to be used (for both spoken and written communication), but also aspects such as communicating the expected outcomes, goals, scope, use of technique and stakeholders to invite. For the selection of stakeholders, the analyst can use the results of the stakeholder analysis.
4. **Prepare materials**: Seldom is an elicitation activity done from scratch without any prior information available. The analyst needs to identify the sources from which the relevant information can be collected. It can be system documentations, process descriptions, manuals, documentation of business rules, documentation from completed projects from the same system/domain, and regulation documents. These sources are within the organization. It might also be worthwhile identifying external sources of information such as how other companies within the same industry have solved the same issues, what kind of support and solutions vendors and consultancy firms offer, and what the available and relevant case studies offer in terms of experience, problems and knowledge gained. Gathering information, orienting and reading up is part of the process.
5. **Prepare stakeholders**: Stakeholders need to be informed and educated about how the elicitation will be done (use of the chosen technique). If stakeholders, before entering the elicitation work, know what technique is going to be applied, they will have a better understanding during the elicitation and therefore be more effective. Likewise, the stakeholders need to not only be informed but also to some extent agree on the objective and scope of the elicitation activity. Stakeholders who fail to see the relevance, importance and necessity of the

elicitation activity within the scope, can pose challenges during the process. In addition, stakeholders should be informed about how many meetings, how long each meeting will be, location, what is expected of them, and if they need to prepare prior to the meetings. In general, the more prepared stakeholders are, the more the elicitation activity can focus on the actual elicitation.

The results of the above preparatory work, for each major elicitation activity, can be documented in an "elicitation activity plan". The extent to which an elicitation activity is planned and documented must be aligned with the size of the initiative and the elicitation activity. If the preparations take a dominant portion of the work, there are too many preparations being made. The main purpose and focus of the preparations are to lay the foundation for and fulfill the prerequisites for successful elicitation activities.

5.2 Conduct Elicitation

The main purpose of conducting elicitation is to, by means of selected techniques, draw out, extract and elicit information that is both relevant and needed for the change initiative. Elicitation can take on many different forms but in general, it can be said that there are three main types of elicitation. These are (1) collaborative, (2) research, or (3) experiments:

1. Collaborative elicitation is perhaps the most common one. It is when the analyst is interacting with stakeholders and using the stakeholders' expertise, knowledge, experience and perspectives to elicit information.
2. Research refers to when the analyst uses sources of information that the stakeholders are not directly aware of. The analyst can systematically discover, analyze and synthesize information drawn from various sources such as analysis of historical data, industry trends, external reports, case studies, materials from consultancy firms and so on.
3. Experiments refer to methods used when information that is needed is not known and some form of controlled tests is required to identify that information. In other words, if the information needed cannot be captured from stakeholders or from research, then the alternative might be to conduct experimentation. For instance, if a new portal is needed, there might not be information available as to if the portal will solve the issues at hand and, if so, how and what would be the best way of designing the portal. In such a case, development of a prototype (as an experiment) can provide very valuable information. Similarly, if a company wants to buy a software solution, it might be worthwhile to do a "proof of concepts" (as an experiment) to learn more.

During the "conduct elicitation", the analyst will apply one or several techniques, but regardless of the technique, the analyst is analyzing documents, interviewing stakeholders and/or being part of workshops, either as facilitator or participant.

Although document analysis, interviews, and workshops are elicitation techniques in themselves; they are also used when using other techniques. If an analyst wants to model a certain business process, they will conduct interviews and facilitate modeling workshops. As these techniques are very common and part of many other techniques, we will discuss them below.

5.2.1 Document Analysis

When an analyst starts working with a specific problem or an initiative, it is common to have some existing materials that could be of use. The purpose of reviewing these materials is to get a better understanding of the problem area and re-use work that has already been done. A document analysis provides a good start for gathering background information.

An effective start is to review existing documentation. The documents reviewed should not be restricted only to the specific problem area. If a problem concerns managing a specific type of customer order, there might be instructions, training materials, step by step guides, policy documents or another kind of documented material that describe these specific cases. While this has great value, the analyst must also review similar materials from other cases within the same domain. Furthermore, it is valuable to review marketing studies, guidelines, standards, problem reports, technical documentation, documents given by vendors that have given demos of their products, feasibility studies or documentation from finished projects of relevant areas and organizational charts. There are no lists of documents to review. The analyst has to do some digging and detective work to find the relevant documents.

When conducting document analysis, it is helpful to consider the following:

- **Assess the relevance of the documents**. Not all documents are equally relevant, current or credible. A subjective assessment needs to be made to evaluate if the information is up to date or even credible. Even if the documents are old, they might contain valuable information.
- **Find a structured way to manage the content of the documents**. There will most likely be some valuable things in these documents and the analyst has to find a way to keep track of what was interesting. If this is not done, it will be very difficult to find that piece of information at a later stage.
- **Note information that both support and contradict each other**. If several documents are stating the same things, it gives more credibility. Sometimes one document will say something that is contradictory to what other documents are saying. These cases are very interesting as either one of the documents is simply wrong or there is a good reason why there are different perceptions. These should be noted and perhaps further investigated.

- **Note parts that are either not covered at all in the documents or are covered in a limited way**. These parts might require further investigation to get the bigger picture.

At the end of the document analysis, the analyst should have a list of issues that need further investigation, questions in need of answers and items to cover during upcoming meetings.

5.2.2 Interviews

Interviews, one to one or with a small group of persons, is having a conversation about a specific topic [44]. A well conducted interview can achieve the following:

- Make an initial contact, establish a relationship and build trust with the stakeholder. This is particularly valuable for gaining stakeholder support and involvement.
- Gain in-depth information, understanding, opinions, perspectives, concerns, and priorities of the stakeholder about a specific problem or issue.

Interviews allow the analyst to understand the situation in more depth. If a certain topic is unclear or complicated, the analyst can elicit the information in detail and the interviewee can share concerns and raise issues more freely.

Interviews can be conducted in a structured or unstructured manner. In a structured interview, the analyst has a set of predefined questions that are asked. Conversely, unstructured interviews do not follow any predefined path. The questions will be based on the responses and the interaction during the interview. It is quite common to conduct interviews by mixing these methods. The analyst might also have a set of main questions that are to be discussed but further questions will be based on the responses received (semi-structured).

Conducting interviews is not a task to be taken lightly. The success of the interview will depend on several parameters such as the preparedness and experience of the analyst. The results of the interview need to be documented to help the analyst remember the contents of the interview. Interviews can be said to have three main stages—preparation, conduction and follow up.

5.2.2.1 Preparing the Interview

Purpose/Goal: Preparation for the interview is important. The first question to consider is the purpose of the interview. The analyst should be clear about what he or she expects to achieve from the interview. The purpose needs to be aligned with what the interviewee can provide. A few examples of purpose are as follows:

- Collecting data/information.
- Understanding the background or the specifics of a situation or problem.
- Understanding how a specific situation or problem is affecting the stakeholder.
- Understanding the stakeholder's view of changes or solutions.
- Developing an outline for a solution or validating a specific part of a solution.
- Gaining support for a solution.

Potential Interviewee: Selecting who to interview is part of the preparation. The next question to consider is who can provide this information. The perspective given by the interviewee will depend on their position within the unit. If the senior manager is interviewed; the perspectives shared will be from that perspective. This most commonly differs from the perspective of the operative manager or that of the employee at the operational level (those conducting the work). Potential interviewees can be identified in discussion with the sponsor and other stakeholders. It is also possible that persons who have already been interviewed suggest talking to certain persons or subject matter experts, as they would know more about a specific aspect of the issue.

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Interview Questions: The questions that are to be asked are connected to the goal or purpose of the interview. Even if an unstructured interview is being prepared, it is important to have a clear mind of what information one wishes to gather. It is better to have a set of questions that together achieve the purpose of the interview. These questions also function as an agenda while the conversation around these questions can be "unstructured". Open ended questions (that cannot be answered with a yes or no) are preferred if the analyst is seeking to learn and explore a certain area. When the analyst has gathered information that need to be verified or confirmed, close ended questions are better. These questions can be answered with yes, no or a specific number. When the analyst is aware of something and wishes to verify it, it is better to ask questions such as "does this problem cause you to delay the customers' order" or "how many delays does this problem cause?" It is also useful to plan the order of the questions. The questions can be organized based on priority, significance, or ordered from "general to specific" or "start to finish."

Sending a brief introduction and questions to the interviewee, prior to the interview, can be beneficial. In some cases, where the interviewee needs to collect data, it is better to send the questions in advance to allow them time to prepare.

However, if the purpose of the interview is to talk about sensitive matters, it is better to ease into the difficult questions at the meeting rather than sharing them in advance.

Interview Logistics: The logistics of interviews (considering where and when the interview is to take place) need to be considered. The following aspects need to be considered:

- The location of the interview
  - In person at the interviewee's office, the analyst's work space, or at a neutral place
  - Over a phone or video call.
- Documentation
  - Recorded (audio)
  - Notes
  - Confidentiality (sometimes the interviewee would prefer to talk off the record or have the results summarized, preventing readers from understanding who they are).
- Time
  - Keeping the time agreed on with the interviewee
  - Breaking it up into several interviews.

The analyst should consider all the above aspects in preparation for the interview.

5.2.2.2 Conducting the Interview

The interview is usually divided into three parts – the opening, the body, and the closure. The opening or introduction of the meeting typically starts with personal introductions, explanation of the background and purpose of the project, the particular purpose of the interview and the way the contents will be recorded (notes or audio). It is also important that the analyst has an understanding of the interviewee's role and responsibilities.

The major part of the interview consists of the actual fact gathering (the body of the interview). This part of the interview should follow the main questions defined in the preparation phase. It is important for the analyst to maintain focus on the predefined questions and ensure that the objectives are met. However, some degree of flexibility is required. It is possible that very interesting aspects arise during the interview that need to be explored. Perhaps the discussions are taking longer than anticipated and another interview needs to be arranged. The analyst might sense that the timing is bad due to some unfortunate events having taken place. Regardless of the reason, the analyst should be attuned to such factors and take measures accordingly.

The closure is also important. The analyst can start to close the interview by summarizing what has been covered and the main points made during the interview. Following this, it is good to ask if anything has been overlooked. The analyst can then explain how the information will be used in future work and what will happen next. The interviewee should also be given the chance to ask questions and finally, make sure to thank for him or her input and time.

5.2.2.3 Follow-up

We tend to forget as time goes by. As such, it is good to complete the notes as soon as possible. Once the notes are prepared, it is good to send a copy to the interviewees. This allows them to give feedback on things that might have been missed, misunderstood or incorrectly recorded.

5.2.3 Workshops

Workshops are a form of meetings where stakeholders collaborate for the purpose of achieving a predefined and specific objective or goal [45]. Workshops can be used at any stage of the business analysis process. They can be used to define the current state by modeling as-is process models, for problem analysis, discussing and defining target state, comparing and evaluating alternative solutions or for eliciting requirements for a solution. The collaborative nature of workshops makes it very effective and therefore widely used. A workshop often has a specific purpose or is initiated to achieve a specific goal such as, model a business process, analyze a problem, or compare solutions against each other. A workshop consists of a representative group of stakeholders who in an interactive and collaborative manner achieve the goal of the workshop. A workshop is best managed when facilitated by a neutral and experienced facilitator. If the analyst is a participant, then he or she simply attends the workshop and will be informed by the facilitator just like the other participants. However, the analyst can act as a facilitator. In such cases, the analyst will assume the role of the facilitator and will need to prepare and conduct the workshop in addition to managing the follow-up.

5.2.3.1 Preparing a Workshop

The facilitator (analyst) in discussion prepares these with the sponsor or other key stakeholders. Preparations of workshops cover four main aspects:

1. Purpose of the workshop
2. Participants to invite to the workshop

3. The structure of the workshop (including techniques)
4. Practical issues such as venue.

Purpose/Goal: The purpose or the objective of the workshop answers the simple question of "why are we doing this workshop?" Although the question is simple, the answer might be more complex. The purpose or the objective of the workshop affects who to invite and the structure of the workshop. The purpose can be as follows:

- Create a common ground for the continuation of the work.
- To define the current state.
- To model a business process such as the process of order-to-cash.
- Create better communication between two business units.
- Creatively generate new ideas for improving customer satisfaction.
- Educational—all managers understand the work done by all divisions.

The objective has to be achievable considering the participants and the time set aside for the workshop(s). It would be unreasonable to expect an order-to-cash process to be modeled in detail in a two-hour long workshop. Likewise, it would be difficult to achieve the same goal if representatives from certain divisions are absent.

Participants of a Workshop: Once the objective is set, the participants required for achieving the goal can be identified. Generally, large workshops (number of participants) are not efficient as it is difficult to engage all participants. Therefore, one should try to limit the invitations to participants who have something to contribute. Efficient groups tend to be between five and nine persons. There might be exceptions where it is necessary to have a larger number of participants but that should be more the exception rather than the rule. It is helpful to talk to the participants prior to the workshop session. Such conversations have the advantage of preparing the participants for the workshop (they know what is to be expected), build a relationship with the participants and will give the facilitator a "heads up" about what kind of questions or issues will arise during the workshop.

The Structure of a Workshop: The structure of the workshop is about choosing the appropriate outline/agenda, the techniques that will be used and how the output is captured (documentation).

This structure depends on the objective of the workshop. If the purpose of the workshop is to generate new ideas, using brainstorming techniques are more appropriate. However, if the objective is to model a business process, the following structure could be useful:

1. Welcome and introductions.
2. Clarifying the purpose of the workshop, rules, and roles.
3. Explanation of the technique (for instance bottom-up or top-down approach).
4. Defining the process of where it starts and where it ends.
5. Summary and conclusion.

The structure should not only be aligned with the purpose. The size of the group (number of participants), the degree of familiarity among the participants, the background of the participants, and their comfort with different techniques matter as well. If the group is large, it might not be possible to apply certain techniques or perhaps it would be more efficient to divide the large group into smaller groups that reconvene at the end. If the participants are not familiar with each other, it might be reasonable to spend some time on icebreaker activities to allow the participants to get to know each other and become more comfortable in the group. The participant's background matters as well. If the participants are predominantly from the IT division, they might be more comfortable with certain methods and therefore it is more productive to reference those methods. In short, the structure of the workshop needs to be planned and prepared. The success of the workshop will partly depend on how well the structure and techniques used are aligned with the factors mentioned above.

Practical Issues: The practical issues can be important for a well-facilitated workshop. The venue is perhaps the most important aspect. Booking meeting rooms for workshops can be an option but it is safer to ensure that the venue fits the planned structure of the workshop. A meeting room with 20 persons seated in rows will not be suitable for brainstorming sessions and in such cases, a roundtable might be more appropriate. Practical issues such as the option to re-arrange the chairs and tables and have enough space for all participants are important when deciding on the venue.

Another aspect worth considering is the equipment available in the room (white board, large notepads, projectors and so on). If a workshop is planned for modeling a business process and the venue does not have a whiteboard or only a small notepad, it is going to be very difficult to achieve the objective.

Finally, the scheduling is important. If the workshop is only two or three hours long, it might not matter as much. However, if the workshop is planned for the whole day, it is important to consider times for lunch and coffee breaks. It is also good to book reservations at a nearby restaurant. The practical issues worth considering in the planning phase are different but generally it is better to have considered them rather than being surprised.

5.2.3.2 Conducting a Workshop

A workshop can follow an outline as exemplified below:

1. Preparation
   - Set up the room according to the pre-planned structure and number of participants
   - Set up the equipment needed for the workshop (projector, whiteboard etc.).
2. Introduction
   - Greeting everyone and introducing yourself
   - Present the purpose of the workshop, agenda, roles and rules

- Introduce the participants
- Practical issues such as coffee breaks.

3. Session
   - Introduction to the method/technique that will be applied
   - The actual work
   - Presentation of the work of the groups (if the participants have been divided into smaller groups).
4. Conclusion
   - Summary of results
   - Comparing results with the objectives set
   - Next step (who does what)
   - Next meeting (if applicable).

It is important for the facilitator to ensure that the opinions of all participants are respected, all participants contribute, steer the discussion to the topic at hand and avoid deviations, ensure that the discussions are fact based and about the issues rather than about people. It is very valuable if the facilitator also summarizes what has been said to ensure that he/she has understood the contributions and that all the others have the same understanding.

5.3 Confirm Results

After the elicitation is conducted, the analyst will have a volume of information. However, the elicited information needs to be confirmed. The analyst cannot simply accept the information but needs to ensure that it is accurate and consistent with information from other sources. If the information is not confirmed, there is a risk of either the information being inaccurate because the participants did not have the full picture, were wrong, had misunderstood something or simply representing only one perspective of the issue.

The elicited information can be confirmed by comparing with either other elicited information (using other techniques or stakeholders) or with source information. The analyst might apply two or more different elicitation techniques. If that is the case, the analyst can compare the results (outcome) to ensure that the elicited information are consistent with each other. At other times, the analyst will have elicited information from two different departments (using the same or different techniques). In such cases, the analyst can ensure consistency by comparing the compatibility of the two different sets of information. Another means to confirm the results is to compare the elicited information with source information such as manuals, previous project documentation and so on. If any inconsistencies, errors or contradictions emerge, it is the responsibility of the analyst to investigate and identify the correct information.

Having correct and consistent information is, needless to say, very important. It is not only important for the specification of the solution but also for ensuring that the real problems or needs are being addressed in an efficient way. Furthermore, it is important to ensure that all stakeholders have a common understanding of the facts. If one stakeholder is under the impression that something works in a certain way and another stakeholder sees it differently, it can cause unnecessary confusion, miscommunication and delays to future work.

5.4 Communicate Information

The elicited information that has been planned, conducted (gathered), and confirmed, needs to be communicated. In essence, communicating information is about considering the following aspects:

- **The reason for communicating the information**: The analyst might wish to communicate with stakeholders for the purpose of presenting a solution, requirements, designs, results or progress. It can also be for the purpose of evaluating possible alternative solutions or ways to move forward. Perhaps the analyst needs the results to be reviewed and secure formal approval or wishes to receive the input or decision of certain stakeholders. The reasons for communicating information is not restricted to the above listed, but when communicating the information, the analyst has to consider the purpose.
- **The audience**: The analyst needs to consider who the audience of the information is. The analyst needs to consider what is the role of the stakeholder, what kind of expertise he or she has, what is their interest in the initiative, and what information do they consider to be needed and relevant.
- **The format for conveying the information**: The analyst can convey the information to a group of stakeholders, individually to a stakeholder or use non-personal means such as emails. Presenting the information to a group of relevant stakeholders allows for discussions about the content. Conveying to an individual stakeholder is not time efficient but, depending on the topic, the sensitivity of the matter or importance of the stakeholder, it can be motivating. Finally, non-personal means to convey information can also be used but the analyst should make sure that the content does not contain any verbal comments and that it is self-explanatory and clear.
- **The format of the information package**: The analyst can communicate the information by "formal documentation", which refers to the usage of standard templates used by the company. Such templates usually stipulate the type and format of the information being conveyed. However, the information can also be packaged as "informal documentation" which is, in essence, the same as the formal but with the difference that it does not follow any organizational policies or templates. Another very common way of packaging information is "presentations", these focus on delivering high level overviews that are tailored to the audience and the purpose of the meeting.

5.5 Managing Stakeholder Collaboration

At the heart of communicating information to stakeholders is the idea of fostering a common understanding, gaining agreement among stakeholders, and working towards a common goal. In order to achieve this, the information must be conveyed at an appropriate level of detail and tailored to the needs of the stakeholder. The analyst must also be very attentive and attuned to the responses and feedback from the stakeholders to ensure they have understood the information and are in agreement. It is not enough to convey information in a "one-way direction." We have already discussed stakeholder management (identification, analysis, and management) but the collaboration is an ongoing work. Stakeholders change, new stakeholders might be identified, and their roles, responsibilities, attitudes, influence, or authority might evolve or change. If these are left by themselves after the initial stakeholder analysis, issues might arise. As such, the business analyst should monitor and continuously consider such changes and how it might impact their involvement with the work. Poor relationships can quickly manifest themselves in the form of not providing quality information, reluctance or resistance to change, diminished support or participation, or discarding valuable information provided by the analysis work.

One of the main benefits and elements of managing stakeholder collaboration is gaining agreement on the commitments that are required and made. No analysis work is possible if resources are not allocated to the various activities. These decisions rest with stakeholders and the analyst should secure their commitment early on. However, as things change, priorities, attitudes or a myriad of other things might change. As such, good stakeholder collaboration increases the chances of keeping the commitments.

In summary, a good and healthy collaboration is the foundation on which to gain agreement, secure commitments, work towards the same goal, and deal with emerging problems and issues, in a constructive manner that does not hamper the analysis work.

5.6 Elicitation and Collaboration with Digital Tools

In the digital era, elicitation and collaboration is not restricted to face-to-face within the same physical location. Digital technologies have enabled connecting with stakeholders located at different locations. A workshop might be conducted with participants located in different continents. When the stakeholders are dispersed, online collaboration is many times preferred over face-to-face as it is more convenient and cheaper. Some companies might have their business units in one country and their IT support in another. An analyst working on a case affecting divisions across different countries, cannot expect all stakeholders to gather at one location. Neither is it cost effective for the analyst to visit all locations. As such,

elicitation and collaboration conducted by means of digital technologies is part of the analysis work in the digital era.

Online collaboration needs to be set up. One concern is selecting the appropriate tool. The choice of tool will depend on the requirements of the task, familiarity of the participants with the tool, and their willingness to learn to use a certain tool. Table 5.1 summarizes the most common types of tools used in e-collaboration.

Online collaboration that requires dynamic communication and immediate response, employs "synchronous" communication tools. Examples of synchronous tools are text-based chat applications, audio- or video calls, or solutions that

Table 5.1 Basic tools for E-collaboration

Tool	Comments
Electronic mail	A standard tool for asynchronous communication. Allows sending text, links as well as attached documents in any format to selected recipients. If an email includes sensitive data, it should be encrypted
Instant messaging	Messaging functionality is either built into email applications or as a separate application. Instant messaging apps are commonly combined with voice calls and video conferencing features
Voice calls	Voice over IP (VoIP) is a cost-saving way to communicate when participants are at different locations. It is preferred over video conferencing if there are many participants. It can be combined with application sharing if the participants need to see a presentation or other important additional information
Video conferencing	Video conferencing is used for one on one meetings or small group meetings. It is good for interviews as expressions are visible to the participants
Application sharing	Application sharing shows one computer screen (or specific applications) to all participants. Some tools allow also remote control of the application. It is often used for presentational purposes and combined with voice or video call, such as in webinars
Document management system	Document management systems are used to provide stakeholders accessibility to project documents. Participants can be permitted to view as well as edit documents. Usually all the project participants have access to the same documents to ensure consistency of data and transparency of the project
Social networking system	Social networking system is an online space for informal communication. Useful for team bonding as well as brainstorming and event sharing. Larger companies can have their own internal social networking systems, while smaller ones use global platforms like Facebook
Version control system	Version control systems allow to document and track various revisions of documents. It ensures that the team is working on the same version of the document and helps to find relevant parts from older versions if recovery is required
Project management system	Project management systems help to keep track on project deadlines, to-do-lists, and synched calendars. Used to organize the resources, timeline and tasks of the project

combine text with audio-visual channels [46]. The closest digital option to face-to-face is video conferencing. Video conferencing allows for the analyst to capture the intonations, gestures, and facial impressions. Collaborative text tools such as Google docs, where participants can collaboratively edit text, can also be used. Such collaborative text tools can be very useful for requirement documentations.

Asynchronous communication is when information is exchanged over time i.e. not real-time. Emails, discussion groups, and online file sharing platforms are examples of asynchronous communication [47]. The strength of asynchronous communication is its facilitation of sharing information in different formats (files), editing, and commenting abilities [48]. Asynchronous tools also allow for shared calendars as support for the project management. In addition, shared calendars can be used to facilitate scheduling of events, interviews, and workshops. Data collection by means of surveys and analysis of survey data is also facilitated by asynchronous tools. Online communication tools can also fall somewhere between the synchronous and asynchronous spectrum. For instance, synchronous channels can be used in an unfocused manner. In such cases, people are tuned into a conference call but work on other tasks at the same time [46].

The general rule when considering technology for online collaborative activities is, the more complex the activities, the richer the channels used. For instance, if a workshop is set up to model processes, it will be nearly impossible to do so by means of group-chat. Rather, a mix of audio-visual tools, screen sharing, file sharing, and collaborative text document tools are required. One must also consider the digital skill of the participants. For successful online collaboration, all participants must be able to use the tools at the level required for the task at hand [46]. Naturally, all participants must have access to the tools and in many cases, have the appropriate hardware and software installed. At times, it might be necessary to consider the connection speed as well. If the data is sensitive, one must also ensure that the tools are in accordance with the company policy. Some companies might not be comfortable with using external cloud-based services such as Google docs.

Besides technical set up and skills, one should consider the style of communication. Digital channels make the communication prone to misunderstandings. Hence, online collaboration benefits from strong guidelines [49]. For example, when a document is being collaboratively developed during an online workshop, it should be made clear that participants cannot delete others' work during the process. It seems like an obvious rule to follow, but the analyst should not assume that participants will use the tools uniformly but clarify what is expected. Otherwise, important information might go missing. E-collaboration, especially when done by asynchronous communication, should be framed with clear deadlines. Even though it is convenient to respond any time, the "any time" should not be in the unknown future. Communicating the aims and rules of the online work will reduce the misunderstandings and help the analyst to retrieve high quality information. If most interactions take place online, it is better to include some face-to-face meetings, especially in the initial stages of the analysis process when goals and motivations

are shared with the stakeholders [50]. This will help to build trust, which is one of the key success factors of online collaboration [51].

Compared to face-to-face interactions, online communication tools allow information exchange amongst many stakeholders. The number of people engaged in online activities can be much higher than traditional meetings or interviews. It gives an opportunity to collect input necessary for a successful analysis process [52]. It also gives a good understanding of the opinions of the majority. This is important if the solution will influence larger number of people. In addition to elicitation activities, online tools can be used for stakeholder management. For example, providing access to documentation of activities and gathered material, allows stakeholders to keep track of the process, even if they are not directly involved.

As can be seen, e-collaboration has great benefits, but its usage must be considered carefully. The analyst working in the digital must be aware of what can be done with different digital solutions, be able to select the appropriate tool depending on the activities, know how to use the tools, and consider aspects such as participants' familiarity and company policies regarding security. The basic principles of elicitation and collaboration still apply. However, the digital tools available make the work of the analyst much more efficient if used properly.

Chapter 6
Business Analysis Plan

Business analysis plan and monitoring is the first of the knowledge areas covered in BABOK. This knowledge area captures tasks that define, organize and structure up to the work that is going to be performed by the analyst for a project. The business analysis plan and monitoring can be said to represent a blueprint of the work the analyst has before him or her. It covers five main areas. The first is a plan of the business analysis work to be performed. In this plan, the main activities, tasks, methods, tools, and deliverables are listed. In defining the work, the need or the problem being investigated and relevant policies are taken into consideration. The second important aspect is the planning of the stakeholders' engagement. Such a plan identifies relevant stakeholders, how the interaction and collaboration with them will be conducted, and how they are to be managed. The third part is about planning the business analysis governance. As the analysts work progresses, many decisions need to be taken and approved. The governance plan clarifies by whom and how decisions relating to the project are taken. The fourth part is the plan for business analysis information management. This plan outlines how the information generated will be documented, stored and made available during the duration of the project and for future use. The final part of the business analysis plan and monitoring is to identify business analysis performance improvements. Both organizations and the analysts wish to continuously improve their analytical effectiveness and work. Improvements can systematically be assessed if there are performance metrics against which the performance is measured. This part concerns the identification of performance metrics for the analysis work.

These five components constitute the knowledge area of business analysis planning and monitoring. However, it should be noted that all aspects are not planned for every project. An organization that has defined what deliverables should, as a minimum, be delivered for all projects prior to review and approval, might have adopted a specific methodology for their software development. In such cases, it is not necessary for the analyst to define such matters every time a new project is initiated. Similarly, if there are clear instructions and policies in place as to how requirements are verified and approved (decision processes), the governance

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plan is implicitly set and incorporated in the standard templates available and used. Some organizations have achieved higher degrees of maturity in regard to business analysis. Such organizations might have clarified performance metrics for analysis work. As such, it is not necessary to define them for new projects.

An analyst working on a complex project that is new to the organization, might find it worthwhile to clarify some of the above-mentioned aspects. If there are no metrics for business analysis work defined it surely will be beneficial in the long term to define, at least some preliminary metrics for personal development and self-assessment. In short, the above contents of this knowledge area should be applied with the consideration of factors, such as the size of the project, the maturity of the organization, and familiarity of the organization with projects. A good rule of thumb is to weigh up the effort required to define and produce such results against the value they will have for the project. Unless the value clearly exceeds the effort, it is perhaps best to leave it as it is.

6.1 Plan Business Analysis Approach

Imagine you are moving to a new apartment. The move represents a change and requires planning. You will need to perform a number of activities to make this move as smooth as possible. However, all the activities cannot be performed independently of each other. Activities, such as packing, need to precede the actual moving. As you plan the move, you will most likely make a list of tasks to perform, who to contact and those things you need to have achieved. Most likely, you will have some deliverables or milestones on your list as well. This plan and list of activities make the plan of "your move" project. The business analysis approach serves in a similar manner, to capture the appropriate way to conduct the business analysis for a specific project. It is important to note that this plan is by no means a final plan. Rather the opposite, it is a preliminary plan that will be changed, adapted and modified.

For a given initiative, the plan should cover the overall method that will be followed, the tasks or activities that will be performed, when (time and sequentially), and how (tools and techniques) they are to be performed, and the deliverables that will be produced. The plan should not be according to the personal preferences of the analyst but rather, aligned with the overall objectives of the initiative (change). As such, the plan serves to capture the best way the objectives can be achieved. A business analysis approach plan should consider aspects such as the following:

- **Background**: A description that gives the appropriate background of the initiative, introduces the problem, why it is important, and outlines in broad terms what the initiative aims at achieving.
- **Objective**: A clarification of the objective of the analysis work in regard to the results expected to be delivered.

- **Scope**: An overall description of the boundaries of the initiative i.e. what it will include and what it will exclude (limitations).
- **Approach**: The overall (mainly predictive versus adaptive) method that will be employed.
- **Activities**: A broad outline of planned activities to be performed with consideration to for instance, method, tools or techniques to apply, time, dependencies, and order scheduling.
- **Complexity and Risk**: Assessing the complexity and risks that might affect the business analysis work for consideration of how to manage and incorporate them in the plan.
- **Approval**: An estimate of time, costs, and resources required to execute the plan for taking the decision (and allocating resources) to conduct the business analysis work.

Some organizations have defined standards their projects and initiatives should follow. In such cases, the business analysis approach has already been defined and the analyst needs to adapt it to the current change initiative. Such definitions will include deliverables that need to be presented, how decisions are to be taken, and the preferred software development method. There is normally a standard template for the business analysis approach which only needs to be populated with specifics of a given change initiative. Other companies might not have matured in this regard. In such cases, the analyst will have to determine how to carry out their work. Let us consider these different aspects when penning out the analysis work.

6.1.1 Background

An organization will have a problem/need/opportunity that they wish to further explore. Initially, the problem/need is vaguely expressed and sometimes it might even turn out that it was not a real problem. However, it is important to capture the perceptions of the problem, why it is a problem and how it negatively affects the business. Furthermore, it is important to define, in broad terms, what are the desired effects or values. For instance, an amusement park has been operating successfully for many years. They are popular and have seen a growth in visitors, but with this growth, a number of problems have arisen. First of all, the physical space is limited. Furthermore, as more visitors are coming from adjacent countries, they are experiencing issues with expensive exchange rates (credit card payments) and long queues (rides, restaurants, and ticket offices). These problems have caused visitors to complain. An analyst might, considering this case, begin with the following background statement.

> *"The number of visitors has increased steadily over the past 5 years. The existing solutions for managing visitors and limitation in physical space are causing bad customer reviews. The current situation is strongly limiting opportunities to grow and exposes the park to the risk of losing visitors. To this end, there is a problem with managing visitors. With a better*

solution in place, the park can improve customer satisfaction and accommodate more visitors and thereby, improve its revenues."

The investigation will, as it progresses, call for refinement or modification to the problem. It might happen that a certain problem stated at this stage, when investigated in more detail during current state analysis, is really not the problem at all but a symptom of another issue. Nevertheless, this initial problem was of enough concern to merit further examination and therefore, initiation of an investigation. Although we cannot be certain about the "real" problem at this point, it is important to begin with a shared understanding. The background should capture the essence of why this initiative is important and merits further investigation.

6.1.2 Objective

Another aspect of the background is to capture the objective of the analysis work. What is the purpose of the analysis and what is the analyst expected to produce? In the example above, it could be to investigate the options available to resolve the situation. This does not mean that a solution will be implemented. It only means that enough data is gathered and analyzed to allow for making a decision. Likewise, the objective could be to examine how digital technologies can enhance the visitors' experience. Again, the analyst is not detailing any solution but investigating alternatives, value, cost, risks as basis for decisions to be taken. The analyst could also get the task of specifically investigating and proposing a solution for improving customer satisfaction. Regardless, it is important for the analyst to have a clear understanding of what is expected at this early stage. The objective is an important input for preparing a plan for the actual analysis work. In the case discussed here, a manager would not probably wish to know how much it would cost to do the analysis before allocating required funds and resources. So, the planning at this stage is also about estimating how much it will cost, what resources are required, and how much time is needed to do the business analysis work in order to provide the results. In order to give such an estimate, the analyst will need to think of how to set up the work, what kind of activities would be required, how much time they would require, what kind of risks there are, what the scope is, and how complex the analysis might be.

6.1.3 Needs

As was mentioned before, the business analysis approach plan should to be aligned with the objectives of the change. It follows naturally that the contents of the plan be adapted to the specific characteristics of the initiative. A different kind of business need requires different activities, approach and so on. Consider a chemical

company operating in a highly regulated industry. Changes in regulations might require changes to the chemical processing methods or different security measures be added. In such cases, changes in the regulations are quite clearly defined, explained, and have externally imposed deadlines. In this case, the business need, to introduce changes that comply with the new regulatory requirements, is quite clear and can be defined early on. Compare this to a company whose online sales are decreasing. While there are some theories as to why profits are decreasing, they are not sure nor are their intuitions backed by data. Here, the work begins with investigating the cause of declining sales. The problem and the scope are not clear at this point. Perhaps the decreasing profit is due to outdated products, in which case, perhaps the counter measure is to focus on product innovation. However, if the decreasing profit is an industry trend (affecting competitors as well), perhaps an initiative to increase efficiency and cut costs is the way forward. Another reason might be that customers are finding the web portal difficult to use compared to competitor sites. If this is the case, the solution will be different than those mentioned before. We see that the nature of the business needs or the problem differs from each other. As the purpose is to meet the business need or resolve the problem, the business analysis plan needs to be aligned to the nature of the business need. As such, the nature of the need or the opportunity being pursued matters to the plan.

6.1.4 Scope

The clarification of the scope serves to create common understanding of what will be considered, define the limits of the analysis work, and to clarify what is to be included and excluded. A clear scope helps the analyst in determining which parts to focus on and those to leave outside of the business analysis work. At this early stage, it is neither productive nor desirable to clarify the scope in detail. Rather, the aim is to get an overview. As such, it is often sufficient to capture the scope with one or two paragraphs and perhaps with a model. One should view this definition as preliminary. As the analysis work progresses, the scope will be more refined and detailed.

6.1.5 Approach

There are two main different approaches influencing the overall plan and its execution. One aspect is the nature and context of the problem while the other policies within the company. In regard to the nature of the problem, there are two main approaches. One is more a “predictive” approach and the other is “adaptive” in its nature. It should be noted and clarified that “predictive” and “adaptive” approaches mainly refer to the “deliver solution” stage of the analysis process. They mainly refer to the project organization that is set up to deliver the results. However, they

have an impact on the analysis work. For instance, predictive methods commonly require more documentation and detailed results from the analysis work. On the other hand, adaptive methods leave more of the detailing to the delivery phase. As such, they have an influence on the analysis work and therefore, the planning. The nature of the problem is also interesting to consider. In general, predictive approaches are more geared to situations where there is a low level of uncertainty, where long term plans can be made, and solutions can be defined quite comprehensively before they are developed and deployed. In a predictive milieu, it is possible to plan and execute without expecting many changes and surprises. In the example above, it is quite feasible to plan such a project by first modeling the current process (if it is not already available), map it to the new requirements and identify where changes need to be made. Following this, the requirements can be specified in detail and then implemented. The costs and timeline of such a project can be estimated with a fairly good degree of certainty. Such a project is quite predictive and would benefit more if a "predictive" approach was taken.

Consider the example of decreasing profits from online sales, where the problem and therefore the solution is unknown. It might become a process improvement project, marketing or a web re-design project. It will prove very difficult to determine which deliverables the project will have, what activities should be performed and almost impossible to approach the problem in a sequential order. Most likely, as the problem is investigated, the analyst will identify new activities and deliverables that need to be produced. The analyst will be much more adaptive but when the root cause is identified, and a project is set up to deliver the solution, an adaptive approach is taken. Let us assume that the main problem is a poor design of the web page. The analysis might indicate a few improvements needed to be made but one cannot know for sure if they will be effective. It would be more effective to begin with improving the web page, test it live with customers (via for example A/B testing) and as more information and experiences are gathered continue with the re-design of the web page. As such, it is an adaptive approach where the end result is not known prior to the start of the project but rather evolves as work progresses.

Predictive approaches usually require higher degrees of formalization in terms of structure, documentation, and representation. If the organization has defined standards, policies, and templates, these are to be used. The work is more likely to be formally documented, and the roles of who is to take what kind of decisions or be involved in approving results are clearer and even perhaps documented. In adaptive approach es, results are generated iteratively where teams discuss and define requirements, only to change, amend, or discard them in a later iteration. Teams usually do not follow a set of templates, but the most flexible approach is taken where models are only produced if it serves their work. The work is ongoing and progressing iteratively and as such, not focused on documentation while the ideas and solutions are being developed. Rather, documentation will be made once the solution has been implemented. Commonly, change initiatives will best be served by taking a stance somewhere between the extremes of predictive and adaptive approach. It might also be so that some parts are more predictive whereas others

more adaptive. Many companies have also created their own variation of an adaptive software development method.

We have already mentioned two parameters that affect the best approach to adopt. In one case operating in strongly regulated industries and the other where the degree of uncertainty is high. It might be for instance availability of stakeholders, degree of experience of the resources involved, procedures for the sign-off of results and decisions to continue with the work, involvement of external stakeholders that require contracts and agreements to be drawn up and signed, when change is highly complex, and the project risk. Adaptive approaches require closer involvement and engagement of stakeholders as compared to predictive approaches. If the stakeholders are not readily available or if they are geographically dispersed, a predictive approach might be considered. Similarly, if the resources involved are inexperienced, high turnover of personnel or contracts is required, a predictive approach might be more suitable. If the change is complex and can have serious consequences if it goes wrong, it is better to reduce the uncertainty as much as possible in order to reduce the risks. The choice is not always clear and easy to take. The need might be best served with an adaptive approach. However, if the current situation of the company is that of high turnover of staff, it might derail an adaptive approach. Table 6.1 gives a few general guidelines of which approach to choose. It should be noted that it is not always that clear cut, when planning the business analysis work. The approach is the main factor and will strongly affect the way the business analyst's work will be conducted.

The approach might also be influenced by dependencies and limitations. In other words, given a certain limitation, it might be wiser to adopt a certain approach. Larger organizations usually have several on-going projects at any given time, and it is likely that there are dependencies between projects where one might require the output of another as an input. When starting with a new initiative, there might be parts of the change that depend on some other project or result from another

Table 6.1 Aspects to factor in when considering approach

Predictive approach	Factor	Adaptive approach
A larger and more complex project	Project size and complexity	A smaller and less complex project
Customers have difficulties being extensively involved during the project duration	Customer/ stakeholder availability	Customers are willing and available to frequently be involved during project duration
Unknown or several complex integrations required	Integration level	None or few simple integrations required
Budget/time schedule is fixed and difficult to change/adapt	Flexibility and tolerance to changes	There is flexibility (budget/time)
Solution requires full feature set to be delivered	Time to Market	Solution can be initially launched with limited feature

investigation. As such there might be a dependency that should be considered. The dependencies should be described together with their linkage and relevance to the initiative in question. The objective of listing dependencies is not to get a clear and final view of all dependencies but rather to ensure that they are not forgotten and are considered in a structured manner. As the analysis progresses, new dependencies might arise, or existing ones be removed.

All initiatives for change will have limitations in their coverage or scope and as such, the need to clarify them. Limitations might be in the form of excluding products, customer segments, markets or functionalities (such as accounting) from the initiative. Another limitation might be that a product is excluded (not covered in the functionalities) but should be considered (be included at a later phase after implementation). A solution might be developed for product A while product B is excluded. However, as the plan is to later include product B, the solution, while not providing support for product B, should be supported at a later stage.

Limitations can also be in the form of time or money. Some situations are urgent, and time is limited. If it is compliance issue and has a strict deadline, the change must be completed within a predefined time frame. This will affect the work and the solution. The time aspect might result in designing and delivering a solution that is not optimal but possible to deliver within the given time frame. There might be a problem that needs to be resolved but with limited funds. There is no point in embarking on a deep analysis and proposing a full solution, only to have it rejected because of lack of funds. It would be much more effective to consider how the problem can be solved or perhaps made less problematic with solutions that are within the budget. The main purpose of listing dependencies and limitations is to consider and be aware of them because they can affect the analysis work and which solutions to choose. The dependencies and limitations define the frame or the boundaries confining the solution.

6.1.6 Activities

Once the approach is known, the business analysis activities are identified. Some companies have outlined the activities and results that are to be produced within business analysis work. If this is the case, the analyst will need to adapt such outlines. If not, the analyst will identify the activities required to achieve the objective.

The business analysis activities identify which activities need to be performed in order to achieve the objectives set. In so doing, it might be useful to think in terms of deliverables. Deliverables will vary depending on the type of project or initiative. However, there are some essential deliverables that are required more often than not. The essential deliverables correspond to the steps of the business analysis process (see Table 6.2). At the conclusion of each step, at least one major deliverable is produced. If the initiative is large, it is useful to have sub-deliverables in order to make it more manageable.

Table 6.2 Deliverables during the business analysis process

Step	Example of deliverables
Plan business analysis work	Business analysis plan
	Stakeholder analysis
Define current state	Current situation analysis
	Defined business problems/needs
	Problem analysis
Define target state	Gap analysis
	Change impact analysis
	Alternative solutions
	Business requirements
Select solution	Benefit analysis
	Cost estimation
	Financial analysis
	Risk analysis
Design solution	Requirement specifications
Deliver solution	Project organization will have its own deliverables
Evaluate solution	Evaluation progress and report

The deliverables can be viewed as milestones along the path of business analysis. Oftentimes, there are decision points along the analysis process. The change initiative might be modified or cancelled at any time. Commonly, the project (deliver solution) will have a project manager who is responsible for all project deliverables ranging from detailing the specifications to testing and implementing the final solution. The analyst might be included in the project as a full-time resource, but the deliverables will still be that of the project. The last step, "evaluate solution", has only one final deliverable, which is the final evaluation where the results of the project are compared with the desired effects. Note that this is not an evaluation of the project. It does not assess how well the project went but rather how well the business needs were met with the solution.

If one deliverable is to model the current business processes, the activities might be as follows:

- Identify relevant processes to model (scoping).
- Review existing documentation such as existing models or instructions (document analysis).
- Plan and hold workshops for modeling (elicitation).
- Create business process models.
- Verify business process models with stakeholders.
- Change and correct the business process models.

Different methods, tools or techniques can be applied to perform the activities. The results of the activities are more important than the methods used. The methods are just a means of reaching the results. As such the most appropriate methods, tools, and

techniques need to be chosen. This might depend on internal policies. Templates and techniques already used in a previous project can be partially or fully reused. The choice of method, tools, and techniques might also depend on the participants. If participants have not worked in IT, it is better to avoid using system-oriented modeling techniques. Another example might be when stakeholders have divergent views of a problem. It would perhaps be wiser to initially interview the stakeholders separately rather than having a joint workshop as a first step.

The analysis plan should also consider the order and the time perspective of the activities. The timing, such as when to start and in which order to perform the activities, will depend on a number of factors. One aspect is availability of resources. If certain key resources are not available at certain times, the activities requiring their presence will not produce results of adequate quality. In some businesses, the resources are busy at certain times. Accounts department staff are likely to be unavailable prior to the end-of-quarter as they are focusing on putting together the quarterly results. Therefore, timing is needed to consider when resources are available. Another factor affecting the timing is the priority, urgency, and external deadlines (such as regulations) of the initiative. If it is an urgent matter, the focus will be to produce as much in as little time as possible. If there are external deadlines, that will also affect the timing of the activities. Finally, the dependencies on other initiatives or projects will matter. Consider an initiative aimed at exploiting data on customer behavior on a company's web page. The analyst can work with activities such as those related to defining metrics, evaluate cost, and assess benefit. However, if there is a dependency on another project to deliver a required component such as, processing capacity for analyzing the data, the analyst will need to consider this when planning. Other aspects affecting the timing could be activities requiring input from other activities. Some activities can be performed once other activities are completed while some can be performed concurrently. Some activities can be performed once while others need several iterations. Finally, some activities are of higher priority or urgency for the initiative and must be performed while others can wait or might even be optional. When planning, one needs to consider the above aspects in order to find a good way of managing them. The plan is only preliminary and can be rearranged, amended or extended.

6.1.6.1 Functional Decomposition

A method to manage complexity and by doing so, reduce uncertainty, is functional decomposition. Functional decomposition is a structured way to break down and manage large or complex entities such as a project. This method can be used to decompose or break down a business process, systems, metrics, and also deliverables. By breaking down the deliverable into parts, each becomes more manageable.

Functional decomposition is a tool that can be used quite broadly. It can be used for estimation by looking at smaller components of a larger estimate, where each

smaller component is more easily assessed and estimated. It can also be used for redefining which elements or components should be separated or merged and managed collectively. The object of decomposition will depend on the purpose. Within project management, a similar method called "work breakdown structure" (WBS) is used [53]. In a WBS, the work to be done is decomposed into stages, milestones (deliverables), activities and work items.

In a similar manner, the deliverables of the business analysis plan can be decomposed into activities. Such decomposition can be represented in many ways but commonly applied is a combination of both textual and graphical representation of the work. Functional decomposition diagrams can be represented as organizational charts, mind maps, decision trees, or flow diagrams. The way it is captured is not as important as its function or purpose, i.e. to allow the business analyst to communicate, validate and verify the contents of deliverables and activities with relevant stakeholders. In the case of deliverables, functional decompositions can be used to take a deliverable, break it down into smaller activities that are required to achieve that deliverable.

6.1.7 Complexity and Risk

All projects differ from each other and their complexity will vary. Assessing the complexity and what contributes to increasing the complexity is necessary. The analyst provides a plan and associated estimates of the analysis work required. This work can be more or less complex depending on certain aspects. The complexity depends on the number of departments or business units that will be involved, the number and complexity of business processes, IT systems, data sources involved, geographical distribution of stakeholders, size of the project, and the type of changes already discussed. The level of complexity, and how it can be managed is part of the analysts' proposed plan.

There are certain risk factors that can impact or affect the analysis effort and work. Risks can be: the experience level of the business analyst—the domain knowledge of the analyst—the degree of experience of stakeholders to change or similar development initiatives—the attitudes of the stakeholders—availability of stakeholders—and time or financial restrictions for the analysis work. Note that complexity and risk in this context, does not refer to that of the solution but concerns the business analysis work.

6.1.8 Approval

The plan should be accepted or approved by key stakeholders. It is not only a formality for providing the resources required (resources and funds), but also a final verification and common understanding between the stakeholders and the analyst

about the scope and the work that is to be done. Different companies manage this part differently, from informal to very formal. The acceptance or approval of the plan is documented and signed by the selected managers. The document to be signed does not include all of the above discussed contents in detail and is more of a summary. The main deliverables might be defined but not the activities; however the details are needed for estimating the cost, and they are included in the document to be signed. The document can also be a form of "contract" with the business analyst detailing what they are going to deliver, at what cost, and within what time frame. By signing the document, the managers agree to provide the resources and the funds for the work.

To take such a decision, it is necessary to know objective, scope, and what the analysis will cost, how long it will take, and what resources will be required. The activity plan gives an overview of these aspects. It might be resources performing the analysis work, subject matter experts, system administrators, developers, business process experts or resources from business support. It is equally important to have an estimate of the timescale required to produce the deliverables. To gain this overview, the analyst will have to roughly estimate each deliverable or activity. The information source for estimation usually comes from similar situations, history or experts' "guesstimates" (guess and estimations). There might be completed projects that have elements or components that are similar to some of the ones of the project being estimated. The outcome (time/cost) of those components can be used as input for the estimates. In doing so, the analyst is re-using previous experiences and cases. This approach is fast, less costly but also less accurate. There are some estimation techniques predominantly used for estimating IT development. A few are presented under "change strategy" but these techniques such as "top-down", "bottom-up", "Rough Order of Magnitude", and PERT, can also be used at this stage. The technique or approach used is more or less irrelevant in comparison with the objective, to gain an understanding of the size of the work ahead.

Experiences and lessons learned from previous projects are far too valuable to discount or ignore. While each project has its own characteristics, previous projects can offer much valued input. Perhaps previous projects can help with identifying a deliverable that was missed or explain why previous projects were delayed, avoiding the risk of repeating the same mistakes or confirming that the drafted plan is reasonable.

It might be worthwhile taking a closer look at previous business analysis plans, its deliverables, activities, the estimates and the actual outcomes. Previous projects might provide an insight into what needs to be considered if the change involves introducing new technology or system support, how such projects impacted the organization (both anticipated and not anticipated impact), and recommendations made for future projects.

By looking at previous experiences, the analyst becomes more confident of the plan made and reduces risks by proactively addressing them. Such valuable information can be collected from documentation of concluded projects. However, not all projects are as diligent in documenting follow up and evaluation results as

they are with plans. Another way is to interview selected persons who were involved in previous projects or who have extensive experience.

If the problem is very complex or unknown and difficult to estimate another approach should be taken. Instead of breaking the work into pieces and estimating each piece, a time period is given for the investigation. Whatever results are achieved, these are used to decide on how to proceed. Let us assume that a company wants to replace an existing system, but they are not sure of the outcome. So, instead of initiating a full study, they ask a business analyst to investigate the matter for no more than one week. In a way, they have "time-boxed" the investigation to whatever results can be produced within that week. Such efforts should give a better understanding of what is needed to solve the problem in regard to time, cost, or resources required.

Below is an example of such a document. In this example, a company has acquired a smaller competitor. Both companies have processing for certain types of contracts. The acquisition has resulted in having "two" departments doing the same processing. This is costly and therefore, the company wants to have only one solution. To investigate the matter, a study is initiated.

6.2 Example: Mapping and Solution for Contracts Processing

Background

IB A acquired IB B in 2018 and as part of the cost saving project they merged both processing of customer contracts divisions. The new division has six different IT systems for managing the customer contracts. The processing is partly manual which is both ineffective and associated with operative risks. This situation limits the volume that can be managed. In addition, the cost of processing is significantly higher than that of the competitors and needs to be urgently reduced.

The objective of this study is to map out the current situation and the processes employed for the purpose of finding long term solutions that raise the IT solution support of the contract processing. A better system support means (1) markedly higher degree of automated processing, (2) significantly reduced costs, (3) more consolidated IT support structure, and (4) better flexibility to manage new types of contracts. The study will focus on the divisions in France and Germany.

Main Activities

1. The study is to map the contracts and contract types, business processes, manual processes and consequences of errors, and IT structure.
2. An understanding of the view of the merged division in regard to their strategic business development.

3. Generation, verification, and anchoring of the main alternative solutions.
4. Technical solution (such as interface analysis, development needs) and analysis.
5. Financial analysis of the alternative solutions.
6. Recommendation of a solution and how to proceed.

The study should also consider other regional business units' processing of contracts.

Limitations

The study will not propose a solution for managing processing of contracts in Italy, Spain, and the UK.

Time plan

The study is to be concluded by [date].

Dependencies

There are no known dependencies at this point.

Resources

- Business Analysts: Joe (lead), Sandra
- Department A: Jeffery, Lisa
- Department B: Rebecca, Jorge
- IT Department: Stan, Christopher.

Managers

- Manger of Business Analysis: Sam
- Manager of Department A: Brad
- Manager of Department B: Marie
- Manager of IT Department: Dasha.

Reporting

Monthly reporting meetings with Sam, Brad, Marie, and Dasha will be held. Final reporting meeting will be held with the managers and other relevant stakeholders.

Costs

Department	Total
Business units	50,000
IT department	30,000
External units	15,000
Total costs	95,000

Decision

To conduct the study at a cost of EUR.95,000
_____ Date _____
Manager of Business Analysis
_____ Date _____
Manager of IT Department
_____ Date _____
Head of Contract Processing.

By the end of this journey, the output is simply a plan defining the objectives, needs, scope, and activities required to achieve the objectives. The plan also states resources required and an estimate of the time and cost of the analysis work.

Chapter 7
Plan Stakeholder Engagement

The main purpose of planning the stakeholder engagement is to lay the foundation for effective, maintainable relationships, and communication with stakeholders [54]. The business analyst will act as a communicator or liaison among stakeholders in the analysis process, ranging from identifying problems, evaluating options, and working on defining the future state. As such developing, maintaining, and fostering a fruitful collaboration and healthy relationship with almost every stakeholder involved along the analysis process, is a clear success factor. The benefits of strong stakeholder engagement are many. First of all, it enables better stakeholder satisfaction. Involved, engaged, and informed stakeholders are more likely to participate, and be satisfied with the results, as they feel part of the process and objectives. This is related to having an effective communication strategy. With good stakeholder engagement, the business analyst can design communication strategies that encourage, involve, and rally stakeholders to support the initiative. This is important to limit scope creep, which can have a dangerous influence. When the scope of the project changes due to various factors, the risks increase. With good stakeholder engagement, the probability of such potentially negative influences is limited. Finally, a successful implementation of a solution is supported by good stakeholder management as the focus pivots around facts, important issues, and increases the probability of finding optimal solutions for the company.

A stakeholder is any person or organization who is either impacted by or can have an impact on the analysis process or the end results of the project [55]. Each project will naturally have its own set of stakeholders. Furthermore, not all stakeholders have the same degree of interest or influence in the project. As such, an important part of planning stakeholder engagement is to identify the stakeholders, then analyze their characteristics, and plan the best way to collaborate and communicate. This plan, although subject to changes and modifications as the change initiative progresses, will be very important for the analyst. Failing to consider the stakeholders, the recommended solution might simply be inapplicable or overlook

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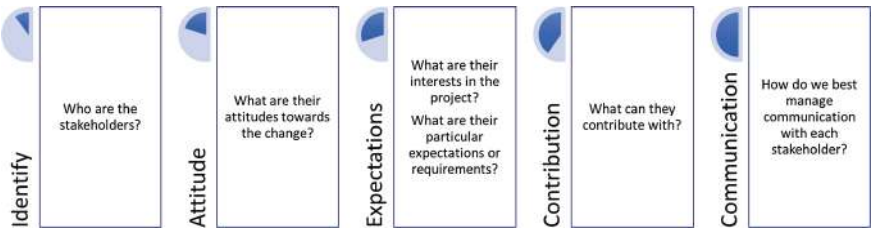

Fig. 7.1 Stakeholder management process

certain stakeholder needs. Therefore, the analyst must conduct a proper stakeholder analysis.

As illustrated in Fig. 7.1, stakeholders must be identified and then analyzed. Their attitudes, expectations, and contributions are interesting aspects to be considered in such an analysis. Finally, a plan can be developed that outlines how to engage and communicate with stakeholders.

The stakeholder engagement process can be divided into three phases (see Fig. 7.2). The first step is to identify the stakeholders for a specific change initiative. Following this, each stakeholder is analyzed regarding several factors. The factors considered can be attitude, expectations, contributions, power of influence, level of impact, proximity to the project team, or any other aspect that is considered as relevant. When the stakeholders are known and how they are affected is clear, a plan to manage the stakeholders can be devised.

7.1 Identify Stakeholders

The first step is to identify the stakeholders. A stakeholder is anyone (1) who shares a common business need/problem, (2) who is affected by the proposed initiative or (3) who has an interest in the solution. Some examples of stakeholders are customers, domain subject matter experts, end users, project managers, regulators, and sponsors. In identifying stakeholders, it is better to take a systematic approach, in particular when working with somewhat complex change initiatives.

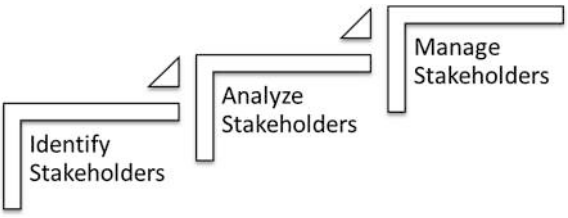

Fig. 7.2 Stakeholder analysis

7.1.1 Stakeholder Wheel

The stakeholder wheel is a way to assist in identifying all potential stakeholders. A stakeholder wheel is a categorization of stakeholders that is used to ensure that all potential stakeholders are identified. Stakeholders can be classified as either external or internal. External stakeholders are those that belong outside of the company such as customers or suppliers. Internal stakeholders are those that belong to or are within the boundaries of the company. The main idea is to first decide which of the categories are relevant to the project. Then, the stakeholders within those categories can be identified. An example of a stakeholder wheel is given in Fig. 7.3.

Among internal stakeholders, we often find operations. Oftentimes an initiative aims at improving some aspect of current operations and as such, they are important stakeholders. Note that related or adjacent business units or departments might also be stakeholders such as internal suppliers. It is important to consider other operational parts of the company besides the one receiving or driving the solution as there might be interconnectedness. An improvement will most likely involve several business units within the company that are connected by processes. When an initiative seeks to make a change or replace a specific system, another business unit might depend on data hosted by the specific system for their reporting. They will be affected by the change and therefore, are stakeholders. Sometimes it might be

Fig. 7.3 The stakeholder wheel

difficult to identify stakeholders even with the support of the stakeholder wheel. If so, one could consult the organization chart of the company as a start and for each unit, ask if they have an interest, or share any aspect of the problem/need. To facilitate this, the analyst can give a brief introduction to the improvement initiative and ask if they are somehow involved or have an interest. Another complementary method is to start with the business units directly affected by the initiative. Following this, the business units providing or receiving information, data, or inputs are examined. The identified units are potential stakeholders.

As change initiatives involve information systems, the IT divisions are a common stakeholder group. Theirs is often the role of implementing solutions and ensuring their maintenance. As such, they are very important stakeholders. It is not necessarily only developers but also managers, architects, advisors, database managers, and other specialist roles working within the different IT divisions.

Managers have decision powers over resources and budgets. Managers have to prioritize, allocate resources and approve costs. Any manager who could be involved in terms of decisions concerning the initiative is a stakeholder. This includes managers at various levels who receive the end results and managers with more administrative roles.

If an initiative affects the customer and the organization's relationship with the customers, the marketing and sales people might be stakeholders. Naturally, this will depend on the organizational structure. Some firms do not have a central division for marketing and sales but have allocated this responsibility to their branches. Others might have given the product development teams the responsibilities of customer relationships. Regardless of the organization structure, if the initiative involves customers, the marketing, customer relationship, and sales people are potential stakeholders. If initiatives require changing, creating new or terminating contracts, the legal department will be involved. As such they will be stakeholders.

Large organizations have offices or central functions to determine good practices that outline company-wide policies and guidelines (policy officers). It might be for IT architecture where criteria are set up for system development. They might decide that they wish to consolidate the technical platforms and strongly discourage the introduction of new platforms (such as new database platforms or systems developed in certain programming languages).

A change initiative might also have external stakeholders. An improvement project might have an effect on its customers. Some will affect customers directly while others indirectly. Some initiatives aim at certain customer segments (premium, large, small, corporate, private customers). Regardless of how they are segmented or how they are affected, they are stakeholders and need to be included in the list of stakeholders. A word of caution is merited here. Consider an amusement park that wants to introduce a digital solution for tickets connected to a mobile app, allowing the visitors to manage their ride schedule more effectively. The visitor is the end customer but will not necessarily be considered as a stakeholder. First of all, the visitors are, as a group, customers. While their experience is much discussed in the initiative and for developing solutions, they are not

stakeholders involved in the project. The visitors' input can be gathered via surveys, questionnaires, focus groups or other similar methods but not a stakeholder to be managed. On the other hand, some solutions target key customers, and, in such cases, the customer will be engaged and therefore a stakeholder.

Some initiatives will affect the partners of an organization. Partners are other companies that have close collaboration. It might be specific vendors who have access to the company's inventory to ensure that the stock is kept at a certain level. It can also be collaborative parties that sell a product via their own platforms. In the digital era, we see more collaboration with partners as compared to before. Regardless of type of partnership, change initiatives might affect the processes and interfaces with partners. As such, they can be important stakeholders.

Regulators can be stakeholders if they introduce new regulations. In one sense, they might not be stakeholders if the regulations are very clear and there are no discussions. However, it could be that regulators present a draft and companies in that industry have an ongoing discussion with the regulators. It might be to better understand the regulations or try to affect the regulator to make minor changes as it would facilitate compliance. At other times, a company might wish to have a good communication with the regulator to ensure that the solution delivered, complies and will be approved by the regulator.

When merited, other sources are worth considering. An example is organizational charts. Such charts can be used, in combination with interviews, to assess which other departments might be affected by a certain change initiative. Another source is looking into the documentation of concluded or ongoing projects that are similar in regard to IT systems, business units, scope, or processes. These could have the same stakeholders. Looking into such projects could be a good start and offer valuable information. In such documentation, there could be a stakeholder analysis or perhaps highly relevant lessons learned. The analyst can also conduct interviews with other analysts, domain experts, subject matter experts, and different managers to ask stakeholders who could be affected or should be consulted. A workshop could also be conducted for the sole purpose of identifying and analyzing stakeholders. If there are available process models or other documented descriptions of the current state, these can be analyzed to identify stakeholders.

As can be seen, there are several sources available. It is always wise to consider the size and complexity of the change initiative and choose complementary sources thereafter. Conducting several stakeholder identification activities for small projects is inefficient. Generally, it is better to use several sources as it increases the chances of completeness. How many sources should be used or considered? When is it enough? A good rule of thumb is the principle of "saturation." When additional sources do not lead to identifying new stakeholders, saturation has been achieved and continuing with additional sources will yield little value. Such exercises and interviews lead to identifying a long list of stakeholders, which is captured in a simple stakeholder list. Although the list might become very long, it is better to have a comprehensive list than miss a stakeholder. As previously mentioned, all stakeholders will not be managed in the same way. To determine the most optimal way to manage stakeholders, we will conduct a stakeholder analysis.

7.2 Stakeholder Analysis

Once the stakeholders are identified, we can analyze their involvement. While no stakeholder should be neglected, each should be engaged and involved in accordance with their interest, involvement, and value they contribute with. The analysis serves to understand who the stakeholders are, if and how they will be impacted by the changes that are being investigated, their influence on the changes, what their needs are, what they expect and what has to be achieved for them to be satisfied with the change. When stakeholders are being analyzed, commonly their roles, attitudes, and level of power or influence are considered.

The analyst identifies the role of each stakeholder in relation to the initiative. Role, in this context, refers to where the stakeholder is involved or contributes to the change. The stakeholder can be a division affected or, their role is to finance the change. Knowing in what capacity they serve or their role in regard to the change, helps form a better understanding of what interests they have, how they might interact or contribute to the project, and what kind of information they might require.

7.2.1 Attitudes

Unfortunately, not all stakeholders are supportive or positive towards the changes. It is important to assess their attitudes as it will affect the project. Stakeholders who are positive can be or become strong supporters whereas those with negative attitudes can cause problems if not managed properly. The attitude of the stakeholder can be categorized in many different ways [55]. Perhaps one of the most common ways is on an either 3 or 5 step scale. The following 5 step scale or a modified version can be used:

- Active Support
- Passive Support
- Neural
- Passive Opposition
- Active Opposition

The above scale can be used to categorize the stakeholders' attitude towards the project. Let us consider an example. A company might have two divisions that have their own IT support system. As this is costly, the management wants to reduce the costs by replacing the two systems with one system. It is likely that the managers will have a more positive attitude to a solution that proposes selecting the system they work with and perhaps be passively in opposition to selecting the system of the other manager. Most commonly such passive opposition is not shown explicitly but implicitly. The manager could express his or her need for certain functionalities that they know the other system lacks. By insisting on such functionalities, the manager is more or less expressing his or her opposition and preference for a specific

solution. This example illustrates a case when different stakeholders have different sentiments about the same project. Awareness of different sentiments is helpful in finding a way forward and valuable if the analyst will need to take on a mediating role.

7.2.2 Authority and Power

Stakeholders can also be categorized or assessed based on the authority level they have over the activities, deliverables and other factors of the work. In a way, this is the level of influence they have over the project success expressed as influence over budget, access to resources, and decision making. The influence or power can be either explicit or implicit. Stakeholders with explicit power are those that have the mandate to take formal decisions. However, another important aspect is the implicit influence. There are stakeholders who might lack formal decision power but are influential as they are subject matter experts, advisors, or persons who are consulted prior to decisions being taken.

Another way is to categorize stakeholders based on the expected results of the change or project. If a project has external stakeholders such as contractors or consultants, their expectation of the final result is different from others'. Consultants might simply expect their consultants to be hired and payments made in time. However, a customer might have the expectation of having a solution in place within the projected time. Internal stakeholders might have different expectations such as new systems, upgraded software, improved processes, reduced costs or staff. As such, it is sometimes worthwhile to categorize the stakeholders based on similarity in regard to the expected results.

Another dimension for analyzing stakeholders is the impact the change will have on them. Some stakeholders will be greatly impacted by a change but might not have much to say in regard to influencing the direction of the change. The impact can also be used as a parameter to categorize stakeholders. Commonly the categorization is done along "primary" or "secondary" impact to the stakeholder by the project results. Some stakeholders will be directly impacted whereas others will be indirectly impacted.

Yet another perspective is the importance of the stakeholder in achieving the deliverables or the outcomes. A project, heavily centered on the implementation of a new business process, will have process owners or process analyst as more critical stakeholders. However, as the deliverables are achieved and the project advances, the relative importance of stakeholders will most likely change.

7.2.2.1 Stakeholder Maps

Analyzing the stakeholders as suggested above, can present the analyst with more data than is conveniently grasped. Stakeholder maps are diagrams that illustrate the

relationship of the stakeholders and therefore, can help in the analysis work. The most common graphical illustrations used are stakeholder matrix and stakeholder onion diagram. The first, stakeholder matrix, looks at the degree of influence versus interests and the other considers the degree of distance from the core team of the change.

7.2.2.2 Stakeholder Matrix

A stakeholder matrix [56] maps the stakeholders based on two parameters. These are the extent of their power of influence (to support, further or obstruct) and their interest in the initiative/the impact on them at the end solution. Figure 7.4 illustrates an example of a stakeholder matrix. The idea is to map the stakeholders as they actually are (not how one would wish them to be) in the matrix. A variation of this matrix is to have three categories on each axis that results in a matrix with nine boxes. The principle is the same but the scale of categorizing influence and impact, is of a finer granularity.

Stakeholders, who have very little power of influence on the project and are not particularly interested in the results of the project, should be monitored. It is possible that during the project the dynamics change, new information comes to light that will make such stakeholders more influential or more involved. They are therefore monitored and kept informed (to the relevant degree). This might be achieved with monthly e-mails with status updates. Low impact or interest refers to

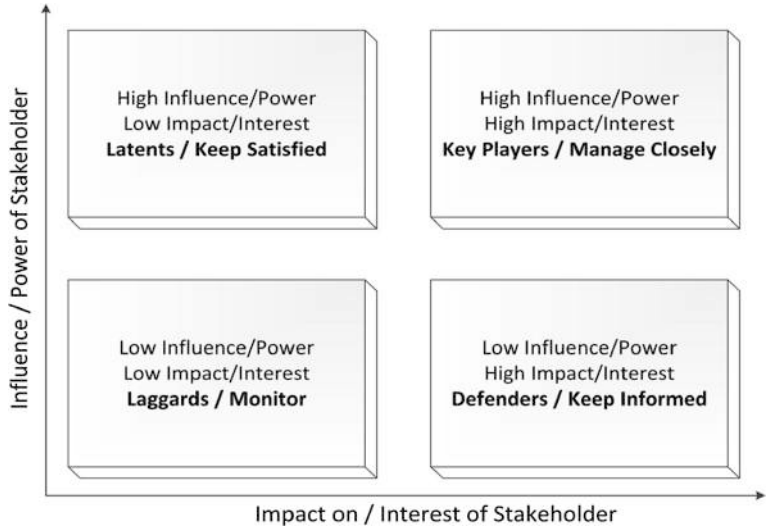

Fig. 7.4 The stakeholder matrix

Table 7.1 Example of stakeholder matrix in table form

Stakeholder	Influence	Impact	Stakeholder Management
Keep satisfied	High	Low	Keep and ensure that the stakeholder remains satisfied
Key players	High	High	Work very closely to ensure that they are in agreement with the changes
Monitor	Low	Low	Keep an eye on the stakeholders' interests or influence in case of changes
Keep informed	Low	High	Ensure a good flow of information to keep them informed.

the extent by which they are affected by the changes, not their personal interest in the project. Stakeholders, with the low power of influence but a higher degree of involvement in the initiative, are kept informed about various aspects of the project. Keeping such stakeholders informed is very helpful for both them and the project. Stakeholders with a high degree of influence and low interest are kept satisfied. This could be a higher-level manager who allocates resources or funds but is typically not involved in the details of the initiative. They are kept satisfied by being regularly informed, so when they take decisions, they are aware and comfortable with the situation. Finally, the stakeholders with the highest degree of influence and high interest in the initiative are closely managed. These are part of the initiative and will have to decide on many aspects of the initiative. The analyst will work closely with these stakeholders. The stakeholder matrix was illustrated as a matrix, but the information can also be captured in table format as the example Table 7.1 shows:

7.2.2.3 Stakeholder Onion Diagram

Another complementary way of analyzing stakeholders is the onion diagram. In this approach, the degree of involvement in the project is considered as the main parameter. The onion diagram starts with the team that is directly involved in analyzing and designing the solutions and moves outward layer by layer. Each layer includes a group of stakeholders. The closer the layer to the core of the onion, the closer the stakeholders are to the core and therefore, more important.

At the core of the onion, as can be seen in Fig. 7.5, is the project team and other resources who are directly involved in analyzing and creating a solution. The next level is the organizational unit whose process and work will be affected when the solution is delivered. These are the units, such as end users who will directly see the value of the solution. The enterprise is the next layer. In this layer, the office of policies, legal department and other stakeholders who interact with the directly affected organizational units are listed. The outermost layer covers the affected external stakeholders such as suppliers, customers, and regulators.

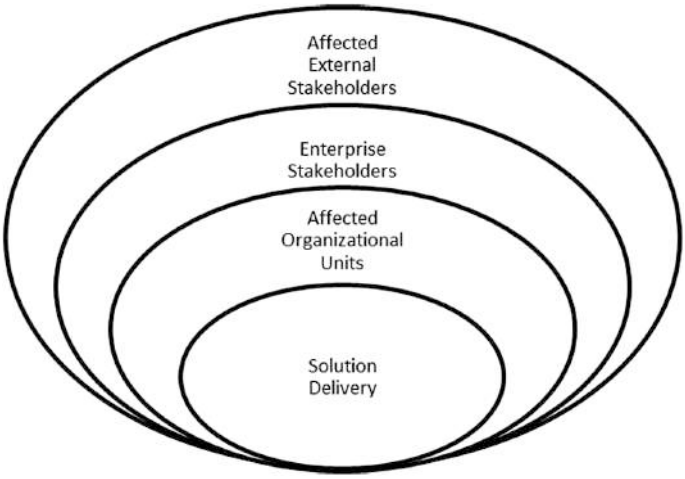

Fig. 7.5 The onion diagram

7.2.2.4 RACI Matrix

The RACI Matrix [57] describes the different roles of the stakeholders in relation to the deliverables or completion of activities. Note that the RACI concerns those involved in the project or initiative and not those affected by it. RACI stands for "responsible", "accountable", "consulted", and "informed" (see Table 7.2).

In a RACI, the level of responsibility of each stakeholder (or group of stakeholders) is specified by being R, A, C or I. A version of RACI is RASCI with the additional letter S that stands for "support."

Responsible (R) denotes the person who is assigned to or will perform a task.

Accountable (A) denotes the person who is accountable for the successful completion of the task and usually is a decision maker. Only one stakeholder can have this role per task.

Consulted (C) denotes the stakeholder or group who will offer their opinion, expertise or information about the task in question. An example would be the subject matter experts.

Table 7.2 Example of a RACI matrix

Deliverable/ phase/activity	R: Responsible	A: Accountable	C: Consulted	I: Informed
Current state analysis	Business analyst	Sponsor	Subject matter expert	Team
Project plan	Project manager	Sponsor	Subject matter expert	Team
Requirements analysis	Business analyst	Project manager/ business analyst	Subject matter expert/business users	Project manager

	Business Analyst	Domain Expert A	Domain Expert B	Domain Expert C	Sponsor	Manager	End User
Stage 1							
Needs Assessment	R	C			A	C	
Scope Definition	R	C	I	I	C	A	
Stage 2							
Analyze Current State	A	R	C	C	I	I	C
Problem Analysis	R	I	I	I	C	C	
Stage 3							
Future State Analysis	R	C	C	C	A	C	I
Stage 4							
Change Strategy	A	C	R	C	I	I	C
Feasabilility Study	R	C	C	C	A	I	I

Fig. 7.6 Example of RACI matrix

Informed (I) are those stakeholders who are kept informed and updated about the progress and the outcome of the task. Note that informed is different from consulted. Informed means the stakeholder will receive information while consulted is someone who also contributes.

Support (S) stands for those who provide assistance or resources for the completion of the task.

An example of a RACI matrix can be illustrated in different ways, but the two main alternatives are either as a table or as a matrix. Table 7.2 and Fig. 7.6 show such examples.

7.2.2.5 Other Methods

There are more methods available for analyzing and mapping stakeholders such as "stakeholder radar diagram", "stakeholder role matrix", and "stakeholder salience

diagram." Although the methods vary slightly, and the analysis is visualized differently, they all serve the same purpose and once one has mastered one of them, the others come easily.

7.3 Stakeholder Management

Once the stakeholders have been identified and analyzed, the strategy for managing stakeholders can be designed. Managing stakeholders has two aspects, the first being collaboration, and the second communication. Collaboration concerns how the analyst and the project collaborate with the different stakeholders, whereas communication secures that the flow of information (in both directions) is maintained and well managed. In a sense, these are very closely related and as such, we merge this into one communication and collaboration plan.

7.3.1 Communication Plan

The analysis work will surely fail if the communication is lacking. As such care needs to be taken to manage the communication with various stakeholders. All stakeholders do not require the same level of detail nor equally frequent information. The stakeholder analysis provides the input required to determine the communication strategy, which consists of the following components.

Why: The reason for communicating should be clear. Is the communication for keeping the stakeholder satisfied, to keep them supporting the initiative, to keep them updated for their upcoming increased involvement or is it to keep an important decision maker in the loop so as to facilitate the decisions that must be taken? The purpose of the communication should be clarified.

What: It is important to consider what kind of information to communicate to various stakeholders. The stakeholders will not be interested in the same kind of information. A stakeholder who owns resources in the project will be more interested in when they can get their resource back rather than what workshops are being planned. The communication content should be adapted to the stakeholders' interest and involvement in the initiative.

When: How often should the stakeholder be communicated with? Some stakeholders are heavily involved and require information continuously. It is important to consider the frequency of (from a scale starting from instant i.e. from when it happens to quarterly reports) the communication. The "when" also considers after which phases, activities, deliverables it would be time to communicate with stakeholders.

Where: Where in terms of location should the information be conveyed? The location (physical and perhaps digital) is considered as well. Perhaps it would be

better to meet a certain stakeholder for lunch and keep it more informal whereas for others a meeting at their office would be more appropriate.

How: How should the information be conveyed? For some stakeholders it would suffice to send an e-mail (written), others might be invited to status update meetings, and important stakeholders might merit conversations or personal meetings (verbal). Additional methods such as wikis, online communications can also be used.

The communication strategy should include the above aspects. The "why, what, when, where, and how" are not independent of each other but related. For instance, when considering the strategy to communicate with an important stakeholder (due to their strong decision authority), the purpose would be to keep the person updated so they can take a decision more easily when needed. At the same time, it is important to communicate via personal meetings at a frequency of, say every second month. Finally, the content (what) should focus on costs, time plans, and when decisions will be required, rather than obstacles, problems, or the quality of the work.

The communication plan can be developed using brainstorming, workshop meetings, interviewing stakeholders (asking them for their input or expectations in regard to communication), discussions with other analysts, or comparison with similar completed projects. It is better to use several sources and inputs when developing the communication plan. One should also bear in mind that the stakeholder management (identifying, analyzing and managing in terms of collaboration and communication) is not static but subject to change, revisions and amendments. As such, it is healthy for the analyst to be flexible to changes, both with regard to stakeholders and changes in the communication plan.

Let us consider an example. A company wants to install a better and cheaper CRM system. The current system is in-house, but its operating costs have been increasing while the functionality has been lagging compared to other solutions. Therefore, the company has decided to change the CRM system by moving to a SaaS (Software as a Service) solution that offers superior data analytics. In this change initiative, the following stakeholders (not a full list) have been identified.

- CIO (also sponsor)
- Project Manager (who will be responsible for delivery of the project)
- Developers (those who will build or adapt the system)
- Legal Department
- Owner of old CRM system
- Testers
- Advisors (who advise and ensure that standards are kept with regards to IT architecture, security etc.)
- End users
- Customers

Let us assume that the stakeholder analysis (based on influence and impact) has been done as depicted in Fig. 7.7. However, note that the first (matrix to the left)

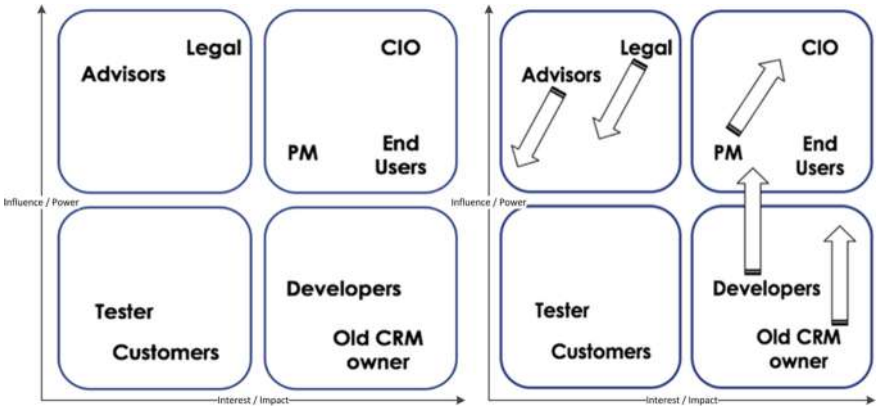

Fig. 7.7 Stakeholder matrix during analysis and delivery phase

covers the analysis phase whereas the second (matrix to the right) is for the delivery phase of the change initiative.

When the analysis is being done, and prior to any decision having been taken about which CRM system to select, the legal department have quite a strong influence as they ensure compliance with legal requirements. However, once such issues have been clarified and incorporated in the design, their role is no longer as critical, nor do they have as much power of influence. Likewise, the owner of the old CRM system will be more influential during the delivery when data migration is to be managed. As can be seen from the example in Fig. 7.7, the influence and impact of stakeholders can change during the change initiative. Let us also take a look at the example from a stakeholder management perspective. Table 7.3 shows one possible stakeholder's management strategy.

The analyst can use this plan to manage the communication with the stakeholders. The example in Table 7.3 shows the CIO will receive weekly status updates by being invited to the status meetings. However, the legal department will be contacted whenever there is a need. This stakeholder management plan is not set in stone. Just as the stakeholders migrate in the stakeholder matrix (as depicted in Fig. 7.7), their management also changes, and the plan is accordingly updated.

7.3.2 Managing Stakeholder Collaboration

Having outlined the stakeholder management plan, the analyst should manage the collaboration with the stakeholders. The management plan is the initial plan but as the work progresses, it is vital to foster a good collaboration. Furthermore, new stakeholders might be identified, the roles of the stakeholders might be confirmed or change, the involvement of certain stakeholders might be strong at some phases of

Table 7.3 Example of a stakeholder management plan

Stakeholder	Why	What	When	How
CIO	Sponsor	Progress, solutions, challenges, requirements, budget	Weekly	Status meetings
Project Manager	Will take over delivery	Progress, solutions, requirements	Monthly (weekly)	Project meetings
Legal	Verify	Legal aspects	On needs basis	Meetings
Old CRM	Maintenance	Migration	Weekly	Project meetings
Developer	Informed	Solution, requirements	Monthly	Progress meetings
Advisors	Verify	Solutions	On needs basis	Meetings/ workshops
End Users	Requirements	Solutions, requirements	Weekly	Dedicated workshops
Customers	Informed	Relevant updates	On needs basis	Email

the work but not as critical at other stages, attitudes and influence of stakeholders might evolve or change. As such, the stakeholder plan is the beginning, but the analyst will have to actively continue the work with managing the stakeholder collaboration during the whole business analysis process. Managing stakeholder collaboration encompasses (1) monitoring, (2) managing commitment, and (3) strengthening collaboration.

Monitoring stakeholders means to be aware of the participation and performance of the stakeholders so as to ensure that the right resources are involved in the analysis tasks. The outcomes of the various tasks are highly dependent on the resources participating in producing the results. If, for instance, due to resource conflicts, less experienced participants are assigned to an elicitation task, the results will be affected accordingly and might prove to be costly (time and effort of re-work or verification). Furthermore, it is important to ensure that results are confirmed in a timely manner, so the process can advance with minimal delays and interruptions. Finally, the analyst should have a finger on the pulse of stakeholders' attitudes and interests in the initiative to ensure they are improving.

The analyst will also manage the commitment of the stakeholders. The analyst's work is dependent on the commitment of the stakeholders and the resources that are assigned to the various tasks. Without them, there is no analysis work to conduct. Therefore, it is vital that the stakeholders agree upon the commitments as early as possible. However, the needs and therefore the commitments change as work progresses. This might require reprioritization and/or negotiation with different stakeholders. Such dialogues are facilitated if there is a good and healthy relationship between the analyst and the stakeholders.

A good relationship is fostered by good collaboration. The analyst, being dependent on the stakeholders, should manage stakeholder collaboration to improve

the relationship, strengthen relations, mitigate and/or avoid negative reactions. A poor relationship with stakeholders is harmful to the work of the analyst. A poor relationship can result in stakeholders shifting their priorities, or they resist changes, ignore or neglect results, create unnecessary frictions and resistance, resulting in a lack of support. However, a good collaboration born of the free flow of information, ideas, and inputs from stakeholders being heard, and their contributions recognized, would facilitate the work, make tackling issues that arise easier, and avoid unnecessary obstacles. The collaboration between the analyst and stakeholders can take different forms and should be adapted to the stakeholder and the need. The stakeholder analysis will offer valuable input to determine how the collaboration should be.

A few suggestions can perhaps help make life easier when managing stakeholders:

- **Listen to the concerns**: Stakeholders may have concerns. If they feel their concerns are not taken seriously or acknowledged, they will become uncomfortable and feel reluctant to support the project or aspects thereof. Listening to their concerns, acknowledging them, investigating them, and giving feedback as information is gathered, helps the process. Their concerns can be valid and considering those helps create better solutions.
- **An open mind**: The business analyst must have an open mind, to be able to view issues from the perspective of the stakeholder. Failing to do so, might lead to discarding issues without having properly investigated the matter or ignoring valid concerns.
- **Find informal ways to communicate**: Formal ways such as meetings have their value and place. Often perspectives and concerns emerge in informal settings and discussions. Furthermore, considering that some might have difficulty in expressing views in front of managers (particularly when they disagree), informal spaces might bring the relevant information to the surface. In addition, relationship and trust are better built in informal spaces and conversations. Such relationships will ease the analysis process considerably.

Stakeholders prefer to get information "before" rather than "after" about changes, important decisions, and upcoming events. A stakeholder might not appreciate being informed of important decisions after they have been taken. They would prefer being in the loop by being informed as soon an important decision is made and if they have any input to offer.

Stakeholder management is not a one-time event but rather a process that is present during the whole analysis process. The stakeholders might change, new ones might be identified, and some might leave. It is a dynamic process. Initially, the analyst will gather the information to identify, analyze, and manage the stakeholders. That is only the beginning. All through the analysis process, the analyst will work with the stakeholders and modify the strategy whenever needed.

Chapter 8
Business Needs, Scope, and Products

Strategy Analysis is one of the five knowledge areas of BABOK. It describes the work of a business analyst to identify, understand and expand on the business needs, considering the capabilities of the organization to address those needs, and elaborate ways to achieve goals and objectives in such ways as is best aligned with the relevant strategies. In strategy analysis, the business analyst works with defining a "future" or "target" state i.e., working to bring about a change that addresses the business needs. The work, therefore, is strategic as it brings about a change in the organization. The change could affect high level strategies or, as is commonly the case, affect mid- and low levels of organizational strategies.

The business analyst creates value in all the stages of the process from identifying a need until a solution is in place and evaluated. For instance, at the initial stages where a need is being discussed, the value is dimly perceived. There is an idea of the desired value, but it is still at a vague and high level. As such, the value is still at an "idea" phase. However, as the work progresses, clarity is gained, and the value becomes increasingly crystalized. Further along the process, a solution starts taking form and is designed. Next a prototype might be developed, or a proof of concepts implemented before a full implementation is made. In this process, the value goes from being an idea to becoming concrete and real. The analyst helps with maturing the value from an idea to an actual implemented solution. This process is also called the "Business Analysis Value Spectrum" [11].

During the context analysis, value is barely an idea. However, when we bring it to the level of a change initiative and discuss business needs, we give life to the idea of value and start its cultivation process. It is in the strategy analysis that the value starts maturing and gradually moves from an idea to a solution. While bearing in mind that the need exists within a context, strategy analysis encompasses the following areas:

- **Current state analysis** – elaboration of the business need and understanding how the organization (in regard to the business need) functions today. The current state analysis sets the baseline for the changes.

F. Milani, *Digital Business Analysis*,
https://doi.org/10.1007/978-3-030-05719-0_8

- **Definition of the future state** – defines and describes the goals and objectives that address the business needs of the organization. The future state (sometimes referred to as target or desired state) simply describes the state that is the aim of the organization.
- **Risk assessment** – understanding the risks (uncertainties) that may affect, hinder, compromise or help the ability of the solution to deliver the value it was designed to deliver.
- **Define change strategy** – understanding what is missing and should be put in place to move from the current to the future state (gap analysis), assessing alternative options for how to realize the future state, and finally recommend the most suitable alternative.

It is important to note that every initiative has its own character. For instance, if an initiative is about enhancing functionality in existing software, there is no need to review the business context. It might be sufficient for current and future state analysis. However, if the project is about digitalizing aspects of the organization that touches upon customers, it might be valuable to consider how the competitors have solved the same issue or what they have to offer in terms of services. As each initiative has its own special circumstances, the selection and application of strategy analysis need to be adapted to the needs of the initiative. In the coming chapters, we will cover the main aspects of strategy analysis but that does not mean they all have to be applied. We begin with business context.

A business analyst works with solving a problem or to take advantage of an opportunity. In either case, some kind of change is introduced. The current state analysis clarifies why the change is needed and what aspects of the current solution will be directly or indirectly affected. Furthermore, if one does not know how things work now, how could one reason as to what needs to be changed and what solutions would resolve the issues? In short, the purpose of current state analysis is to understand how the current solution gives cause to the issues identified. This is necessary if one wishes to introduce relevant changes to resolve the issues or take advantage of identified opportunities.

Although the business analysis process is described in a sequential manner, in reality, the analysts will find themselves jumping between the different stages in an iterative manner. It is simply not feasible or desirable to conduct the steps strictly sequentially without the opportunity to add, modify, amend or remove parts or results. One must bear in mind that this process is like a journey. With new information, perspectives, and data the results need to reflect the new understandings. This is particularly true for digital business analysis. The digital analyst is in a constant state of learning. To strictly follow analysis processes or methods is counter to having a posture of learning. Therefore, the analyst should consider if and how time-tested methods can be applied, use more modern methods, and adapt the tools to the digital context.

When analyzing the current state, although one might jump between parts of the analysis process, the main focus is on the immediate context of the issue at hand. Therefore, the current analysis focuses primarily on the actual product or service

being affected, the processes by which these products or services are created and supported, the information technology used to support these processes, and finally the metrics concerning different aspects of these parts (such as performance, costs, time). These are not the only ways by which the current state can be analyzed but fairly comprehensive in that they provide sufficient coverage. As all problems are unique, the analyst might need to consider other aspects. The first step is to understand why we need a change. There is a reason why solutions are brought to light for analysis. Knowing "why" we need a change is crucial for if the "why" is not clear, how could we know what solution we should develop. Complementary to this, is understanding the scope i.e., the area which will be investigated. Then we continue with the analysis of the product or service that is at the core of the issue. We then move on to how these products or services are produced and managed by examining the "business processes." Business processes are enabled and supported by technologies operating in collaboration with each other. As such, we will also introduce ways to represent the information system structures that support the business processes. Finally, we will look closer at how these processes and information systems are performing in terms of quantitative measures (such as cost and time) both from an internal perspective (internal goals of the organization) and as compared to other organizations (benchmarking). However, firstly, let us look at the actual business need.

8.1 Business Needs

One of the important roles of a business analyst is to correctly identify the business needs [58]. A need can be a problem that should to be resolved as it is causing undesirable effects, or it can be an opportunity that could be explored and taken advantage of. Business needs are strategically important problems, but it needs not be only on a high level of strategy. For instance, a division of an organization that deals with customer service is experiencing dissatisfied customers, causing a negative reputation and potential loss of revenues. Satisfied customers are of strategic importance to this department but currently not the case. Note that the organization as a whole might not have such issues so the strategic importance is not for the organization (not on a high level of strategy) but only for this department. Similarly, other departments will also have their own challenges.

The analyst will have to investigate the need in more detail. The desired outcome or the effect they wish to achieve with the "changes" is satisfied customers. However, the wish of having a satisfied customer is not clear enough. The analyst must analyze the needs to determine, more precisely, what that means. It is almost impossible to have 100% customer satisfaction, especially if you are dealing with large numbers of customers. If the department reaches 60% satisfied customers, has the need been addressed? Should the rate be as high as 80%? Understanding the need is very critical to the rest of the work of the analyst. In short, a business need arises from problems or opportunities facing the organization. It might be a problem

such as a customer churn, operational disruptions causing lost revenues or additional costs. It could also be opportunities that are not exploited such as new markets, customer segments or products. The common denominator is the desired effect that can be achieved but is not currently in place.

As the business analysis process aims at addressing the need, it is very important to know what results or objectives the future changes and solutions should deliver. The success of a solution will depend on how well it satisfies the need. The definition of the need will also guide (or restrict) what alternative solutions can be pursued. The business need must be that of the organization and as such deliver value to the organization and not prefer the interest of one stakeholder or promote the interest of a stakeholder at the expense of another.

8.1.1 Identifying Business Needs

The business need analysis can be done at all levels of an organization's hierarchy and be driven by different factors. A top-down driven business need analysis begins with the strategic goals of an organization that is then decomposed into sub-goals. As such the analysis begins with overall strategic objectives and is broken down into sub-goals, i.e., the steps needed to be taken or achieved in order to realize the overall strategic objectives set by the management board. For instance, an organization might decide to merge two departments in order to streamline their product offering and reduce costs as part of their overall strategic direction. Assume that the departments have their own information system structure and business processes. In merging these departments, a number of sub-goals are identified, one of which might be consolidating the business processes and the information systems. Perhaps this goal is further decomposed into separate processes that are to be consolidated. Each of these sub-goals is then given to an analyst who starts with the business analysis process. In such a case, the business need has come from top management and therefore is an example of a top-down business need.

Business needs might arise from the middle management as well. In such cases, a mid-level manager might wish to improve some aspect of his or her department in order to achieve better business objectives. In essence, it is similar to "top-down" but the scope and extent to which the business needs affect the organization is confined to the department in question.

A bottom-up driven approach begins with perceived pains or problems in existing processes or systems. For instance, the process for reconciling records (comparing what has been entered in the system with a data sheet) might be too costly and slows down the processing time. This particular issue can result in initiating an investigation to see if the reconciliation can be automated having the data sheets scanned, read, and entered in the information system. Such initiatives identified from processes are examples of bottom-up business needs.

External drivers such as changes in customer demands, the market place or competitors can also drive a business need. A competitor might introduce a new

product or add a feature to an existing product. This would trigger a need to add an equivalent feature for the purpose of avoiding customers switching to competitors' products. Similarly, key customers may strongly request additional functionality or service. A distribution company might have a few large customers who make up a significant portion of their revenues. If one or few of such important customers demanded real-time tracking service, it would be difficult for the distribution company to resist such a request. If the competitors offer such services, it might be the only way they can keep their customers.

8.1.2 Solution Based Analysis of Business Need

Business needs analysis is about understanding the need, its context and the driver behind it. In doing so, analysts will often find themselves discussing needs, current state, target state and solutions mixed into one conversation. Those being interviewed or in other forms providing input will jump between these stages of the analysis process. This is particularly true when it comes to business needs, as it seems to be easier to discuss and better understand it by including solutions in the conversations. The solution that in the end will fulfill the business need must generate value for the organization. The need arises from a desire to increase value by means of a solution. Therefore, the business need has a natural connection with the solution. The analyst will need to listen and gather the information while keeping the focus on the current issue. When analyzing the business need, the analyst must be careful not to accept what is said as the complete truth. It is the responsibility of the analyst to get a clear picture of the business need, in particular when discussions intertwine around needs and solutions.

Consider the following example of a financial institution that does business in the Foreign Exchange market, and its dealers use several trading portals. One of the portals offers a chat functionality that allows the dealers to discuss and come to an agreement on trades. Once an agreement has been made, the dealers register the trade in their own system. The trade is then sent to the back office for processing. Foreign Exchange trades concern large amounts and it is costly if a trade is entered wrongly. To ensure correctness, the back office has an activity where they compare the trade details entered by the dealer with the information from the chat conversation. Large volumes, higher personal costs, and the fact that this activity reduces the degree of STP (straight through processing) made the manager of the back office open up an investigation to remove the manual step. This is, by the way, an example of a business need coming from bottom up. The manager told the analyst that they want to have automated comparison between the trade details entered and the details of the trade in the chat conversation. The manager also said that the service provider (owner of the software that offers this service) has a system for reading the chat conversations and comparing them with the trade details. Furthermore, there are three different software providers that offer the same service. The manager then clearly identified the business need to evaluate and implement

the most suitable of these alternative solutions. In this case, the manager is expressing the need through a solution.

The experienced analyst did not readily accept this as the need. Having analyzed the matter, the analyst realized that the need is not to have one of these systems. The need is to increase the automation of the back-office process while maintaining the correctness. The need was to ensure correct trade registrations without it being done manually. Further investigation showed that such software read the conversation of the chat and extracted the trade data. However, as the conversations might include negotiations, there is a chance that the software might read the wrong price. The FX trades in large numbers, and they were concerned that a few mistakes would be enough to offset the gains made by automating this activity. Furthermore, it was found that such software does not solve the problem of wrong trade data because the source of the errors is the traders, not the reconciliation. Once the business need was understood, the analyst re-directed the focus to investigate solutions that automated trade registration at the source.

In the above example, the analyst conducted current state analysis, discussed the needs, investigated how the software solutions worked before coming to the conclusion that the need is not for new software. This shows that the business need might be something that is formulated but can be refined, clarified and better understood as information is gathered and analyzed. However, the business analysis process is not supposed to advance for months before the business need is understood. As part of the work of getting a clear picture of the business need, the analyst can do some preliminary business analysis work such as process modeling or document analysis.

In working with analyzing the business need, it might be helpful, as mentioned before, to consider it from the perspective of the solution. A solution is, in the mind of the stakeholders, more concrete and tangible. Hence, discussions around the solution and its relationship to the issue can help to better understand the business need. In having such discussions, it might be helpful to highlight a few perspectives. For instance, if a solution is presented, it might be helpful to begin with the solution and discuss what the underlying source of the problem is that they wish to solve. In doing so, the analyst is shifting the focus from the solution to the issues giving rise to a need for a solution. Another perspective is adverse impact. Rather than focusing on the solution, the analyst can ask about what adverse impacts the current state is causing. By asking questions such as “how is the current situation having an adverse impact”, “what is a direct result of the current situation”, or “who is impacted by the current situation”, the analyst is again moving focus from solution to the underlying need. In a similar vein, the analyst can ask about the consequences of not addressing the issue. For instance, by asking what will happen or the costs of not solving the issue, the analyst can focus the conversation on the needs. Sometimes it might be helpful to discuss how quickly the solution would solve the problem (or how quickly the problem can be solved). It can also be valuable to consider how they perceive the solution will deliver value (how will it increase the revenues and/or reduce the costs). All questions cannot be used as a

formula, but they can help the analyst in re-directing the conversation to the underlying needs rather than the specifics of a solution.

Let us revisit the example above where the manager has a clear idea of the need to implement new software. The analyst can discuss the solution with the manager and ask what the source of the underlying problem is that the solution will resolve. Such a discussion could probably expose the real problem of manual trade registry. Furthermore, discussions about the consequences and the costs of the current situation together with how the solution will deliver value can make the business need crisper. Discussions about the impact of the problem would clarify that it's not only the manual work and the cost that matters but also the correctness. Examining the impact by looking at some cases where the trade had wrong data and the cost of correcting it, gives a better understanding of the financial impact of such errors. Discussions about how the solution will deliver value might further confirm that it's the reduction of trade data errors rather than saving time that is the main benefit. These discussions will alert the analyst about the real business need.

8.1.3 Digital Goals

As we have seen, digitalization can enable value creation in all building blocks of a business model. To tap into this potential value, organizations explore change initiatives that satisfy business needs with strong presence of digital technologies. Increased profitability remains at the core of all business needs. This has not changed in the digital era. However, digital technologies have characteristics that make them better suited to achieve increased profitability by means of growth, customer engagement, productivity, market positioning, and innovation [59].

Growth is oftentimes considered as one of the most important business goals, both generally and specifically for digital initiatives [60]. The aim is to use digital solutions to increase revenues. One way is to utilize digital channels to reach global markets without heavy investments. Digital products can be scaled up, but physical products require partnerships to overcome limitation of delivery. With digital technologies, cost of collaboration and transaction can be kept at low levels, allowing companies to focus on their core value creation. Enhancing customer engagement is one of the main business needs that can be satisfied with digital solutions. Better customer engagement helps foster customer loyalty. In the digital era, customers' expectations have increased. Customers want fast response, personalized information, and to interact with companies via multiple channels. Companies employ digital technologies to both keep up and even stay ahead of the customers in order to get, keep, and grow revenues. Improved productivity is another way profitability is improved. Better productivity means achieving more within the same cost and time frame. We have seen how automation of repetitive tasks enables increase in productivity. A task not easily automated can also be supported with digital solutions to increase productivity. Digital solutions support employees with a seamless communication and collaboration tool as well as access

to right data at the right time [61]. Market positioning has become more relevant in the digital era. Customers are exposed to a larger number of ads on a daily basis. Market positioning faces the challenge of standing out in such ad crowded spaces by delivering a consistent image and message and clarifying what the company and its products stand for. Finally, digitalization has and is transforming processes across different business functions. As such, innovation has become increasingly important and a goal in itself. Innovation is no longer focused on customer facing aspects but, on all levels, front to back.

The digital era has introduced technologies that has driven innovation of business models. Some companies have been proactively exploiting digital technologies to deliver value. This has pushed other companies to keep up if they wish to remain competitive. At the same time, companies using digital technologies to enhance value creation, have to work on keeping their advantage. This has given rise to business needs to catch up and maintain advantages. In particular, business needs to grow, advance customer engagement, improve productivity, strengthen market positioning, and increase innovation rate.

In light of this context, business analysts have to work proactively with identifying digital needs i.e. needs that must be satisfied for the company to catch up with competitors or maintain hard-earned advantages in the market. In addition, traditional business needs can be viewed in light of digital technologies. When discussing business needs with stakeholders, the analyst can include and incorporate digital technologies into the discussion and thereby, enhance potential value delivery. Digital technologies do not only consider business needs related to customer facing aspects. Other aspects such as operations, distribution, supply chain, and governance are equally important with potential value creation.

8.2 Scope Definition

When preparing the business analysis plan, the scope was outlined. However, when working on a change initiative, and as the business need has been elaborated, the scope needs to be elaborated as well. The reasons are the same, to better understand what to include, where to focus the efforts, and what not to include. The scope can be defined with "scope modeling." Scope modeling does not prescribe any particular way the results are to be presented. This leaves the analyst with the freedom to define the scope with textual descriptions, visually by using diagrams or figures, using matrices or a combination of these forms. Furthermore, scoping can be done from different perspectives such as product, project, processes, markets, IT systems, etc.

A model might include defining the scope by clearly marking the elements that are within the scope (in-scope) such as a functional diagram. It can also capture the in-scope as a black box and represent elements outside the scope (out-of-scope) such as a context diagram [62] (see Fig. 8.1) or, include both elements (in and out) with boundaries between them clearly defined.

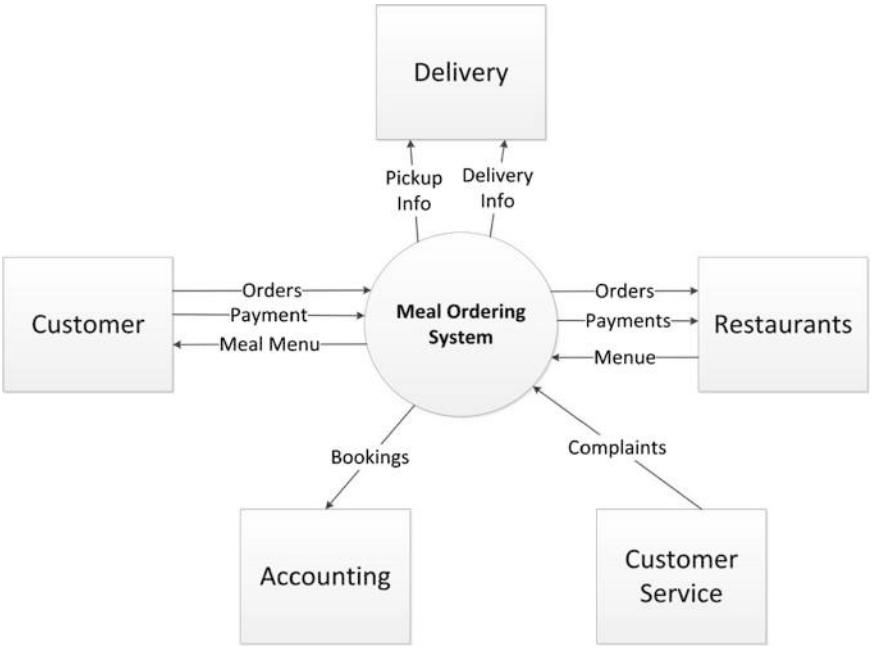

Fig. 8.1 Example of context diagram

The choice of how to define the scope will depend on the nature of the need, problem or opportunity being pursued. A scope might be defined in terms of business processes that are to be included or excluded, capabilities that need to be created, enhanced or decommissioned, support for new cases or situations in the business, or outdated technologies that need to be replaced. Perhaps the most common types of scopes are those of product scope, project scope, and solution scope:

- Product scope takes the perspective of a product, its features, functions, systems used, external systems or entities such as resources that are relevant to the product.
- Project scope, on the other hand, considers what needs to be performed in order to deliver a product, service, or a set of results. From this viewpoint, the main aspects focus on what is needed (information, inputs etc.) for the product/service/results, who will be using the them, and what is the product/service to do and include.
- Solution scope begins by considering the current state and what is required to make a set of changes that will deliver a future state that resolves a problem or meets a need.

The scope model can represent, for the purpose of overview and understanding, the boundaries of control such as what is to be investigated, analyzed and worked

on, roles and responsibilities of various internal and external stakeholders. It can also represent the scope of need of different stakeholders or the scope of the solution, such as the impact of change and value delivered for various stakeholders, departments or organizational units. Regardless of the boundaries one chooses to emphasize in the definition of the scope, the model should clarify what elements are included and how they are relevant.

A sound definition of a scope also includes related elements that are outside of the scope. The scope can be made clear and assist understanding by marking what is out of the scope. It can be elements that most stakeholders would ask about. If a company wants to implement a new customer support system, questions might arise as to which markets are going to be affected. As such, the definition of the scope is made clearer if it explicitly states that the solution will include, at least initially, the North American market and not the European one.

The relationships between the elements of a scope model should be made explicitly clear. By capturing the relationships, the scope model becomes increasingly complete, assists in identifying, and eliciting both the dependencies that might exist and other affected elements. Depending on the type of diagram one chooses, the relationship types vary. One of the common types of relationships is hierarchical decomposition. The parent-child (sometimes referred to as composition-subset) relationship depicts the relationship of elements of the same type. In essence, such relationships depict the relation of an element and its components. An example is functional decomposition [63]. This method begins at the highest level and breaks it down into smaller components. The breakdown can be made at several levels, but usually confined to no more than three or four. An example is illustrated in Fig. 8.2 for implementing a new online food order and delivery solution for a restaurant.

Another perspective of capturing relationships is that of function and responsibility. In such representations, the functions are related to the stakeholder, organizational unit or any other agent that is responsible or interacts with that function.

Fig. 8.2 Example of functional decomposition diagram

A use-case diagram [64] is an example where the agent and his/her relationship with different functions is captured (see Fig. 8.3).

Process models and data flow diagrams use another type of relationship. In such models, the sequential order of "movement" is captured. Suppliers' relationship with the consumer is another example. Here, elements are connected to the consumer by means of transmission of information or materials. In some cases, the scope or the relationships between different elements are complex and do not allow them to be easily defined according to the types described above. In such cases, the analyst will have to be creative and find a way to capture the scope. It will be important to ensure that the model serves its purpose, namely the boundaries of the project.

The strength of scope modeling is its usefulness as the foundation for creating a common understanding of the project or initiative, what aspects need to be investigated, and what relationships need to be considered. It might be helpful in identifying ambiguities, assessing the completeness, and to identify where the project will have an impact. However, at this stage, the scope is defined at a high level. The idea is to reduce uncertainty by defining the boundaries and as such, it is important to avoid "analysis paralysis" that comes from going into too much detail.

The scope might have to be adjusted when more information is elicited. In some cases, there might not be issues with redefining or refining the scope. However, one should not discard the possibility of resistance against changing the scope. Furthermore, the scope is based on assumptions, understanding, and situation at the time of its discussion. As work progresses, some of the assumptions might be off target, the situation might change, the need of the stakeholders might evolve, change, or mature and new technology might be brought to light. Such factors can have an impact and merit a re-examination of the initial scope.

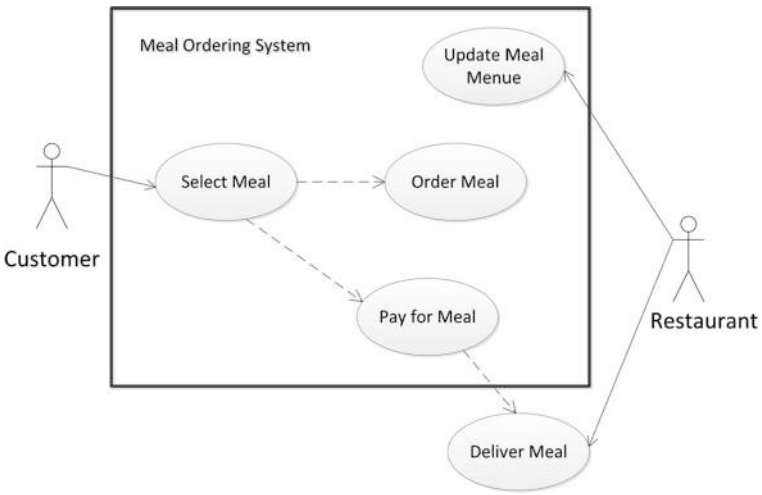

Fig. 8.3 Example of a simple use-case diagram for ordering food via an online system

8.2.1 CATWOE

When dealing with complex change initiatives, it will be helpful to have a checklist or a series of perspectives to use alongside the scope definition. For this purpose, CATWOE (stands for Customers, Actors, Transformation, World View, Owner, and Environment) is very helpful. The CATWOE framework was first introduced by Peter Checkland [65] as part of his software system methodology. The primary focus is to analyze complex situations using different views and perspectives. CATWOE stands for the following:

- **Customer**: The first aspect to consider is the customer. The questions to ask and find the answers to surround who will receive thefollowing solutions:
  - Who are the customers?
  - Who will benefit if this change is made?
  - Who will receive the change?
  - How will they be affected if it is solved?
- **Actor**: The actors are the key people involved in the situation and with the implementation of the change. Here, the analyst seeks to understand who they are, how they will be affected, what their attitudes are etc. This section corresponds quite well with stakeholder engagement.
- **Transformation**: Transformation refers to all processes, systems, policies, and other aspects that will be transformed in some way with the change implementation. In this regard, questions that aim at getting an understanding of the current state become interesting. Examples of such questions are as follows:
  - What are the processes of transformation (from input to output)?
  - What are the inputs and outputs?
  - Where do the inputs come from and where do they go?
  - How are they impacted and how will they be impacted by the change?
- **World View:** The world view aims at capturing the "bigger" picture or in other words, the impact of the change. It considers the real long-term problem which this particular change might help to solve. Simply, it is to look beyond the current change and understand where it fits in the larger context. Some of the questions that might be interesting to ask in this regard are as follows:
  - Is the change part of a "bigger" change?
  - Is the change aimed at larger effects or focused on short term gains?
  - What is the wider effect or impact of the change?
- **Owner:** The owner considers the aspect of who owns the change initiative, i.e., who are those with authority and decision-making powers to determine if the change initiative proceeds, to cancel it or to modify the change. In this regard, it might be interesting to understand what would motivate the owners to help or to affect them to stop the change.

- **Environment:** The environment captures the limitations, restrictions, or constraints that affect the change. Constraints can be imposed due to financial, legal, or ethical reasons. However, it might also be limited access or availability of resources or other projects or change initiatives. Understanding about the environment allows the analyst to recommend suitable solutions and better understand how they can be managed.

As can be seen from the above description, CATWOE is particularly strong in covering the many aspects or facets of a change initiative. The analyst might find it valuable to combine a few different models to define the scope, each complementary to the other but collectively covering all aspects of CATWOE. A word of caution is in place. It is possible that the scope evolves and gets modified as the process progresses. Most changes do not require extensive scope modeling. However, if the change is large and complex, has many different processes, systems, departments, and stakeholders are involved, then it is wise to define the scope with models. Mostly, the changes being investigated are of manageable size and to write a few lines or paragraphs about the scope will suffice. In other words, the definition of the scope should be in relation to the size and complexity of the change.

8.3 Products and Services

The product or service (value proposition) of a company is one of the most important parts of its business model. We have discussed business models and we now expand the block on value proposition [23, 25]. Most initiatives strive to improve some aspects of the company that directly or indirectly affect its value proposition. It can, therefore, be important to understand, as part of the current analysis, the value proposition.

The value proposition defines the product or the service that the company is producing. It aims at resolving a problem or fulfilling a need of a customer segment. The value proposition should be highly integrated with the customer segment. Business is dependent on delivering value propositions that customers are willing to pay for and therefore, customer segments matter. A good solution is a fit between the product being offered and the market where customers are. When this balance is in order, there is a "product-market fit."

8.3.1 Value Proposition as a Package

A value proposition can be seen as a package that relieves a pain and creates a gain for a customer. A value proposition is more than just a product or a service but rather a package of different components that together, offer a specific value

proposition to the customers. A company might sell a small GPS tracking device that you can attach to your bicycle, luggage or other valuables and in the event of loss of theft it will locate the items. The value proposition they offer is the ability to track your valuable objects. However, to enable this, the value proposition consists of a set of features, a physical object that is manufactured, licenses for using GPS satellites and digital components such as mobile apps to enable tracking. As such, the value proposition consists of a set of different components (package).

To map the value proposition package for products, the following questions could be considered:

- What are the features that the value proposition offers? In the case of the tracking device, the features might be real-time tracking, remote activation/deactivation, and alerts triggered by the distance from a pre-determined reference point.
- What are the key physical parts of the value proposition? In our example, the physical component is the tracking device that is a physical object attached to the object one wants to track.
- What are the key intangible/immaterial components of the value proposition? A tracking device might have a specific algorithm that has been patented, or the solution requires licenses to use specific GPS tracking software or subscription to map software.
- What financial components are included in the value proposition? The tracking might come with a warranty or the possibility to buy insurance that will cover the loss of objects due to malfunctions of the tracking device.
- What digital aspects are included in the value proposition? For the tracking device to work, the company must offer a mobile app to enable the owner to track his or her objects.

The above questions should provide a clear understanding of the value proposition and what components are required to offer that value to the customers. However, if the value proposition is a service, then it might be valuable to consider the following questions:

- What is the core of the service? It is important to be clear about what is the fundamental service being offered by the value proposition. It might be simple services manicured to more complex services such as consultancy services.
- What pre-sales services are included in the value proposition? Does the value proposition, as part of its package, offer any services or assistance with making the right selection (such as peer reviews, ratings and so on) or does the service offer financing help (such as leasing alternatives and loans)?
- What after sales services are included in the value proposition? After sales refers to services that are offered to the customers after they have purchased the service such as free or paid maintenance, helpdesk, self-support or other support services.

In addition to the above that focus on the package of components required to deliver the features, it might be worthwhile to consider a few additional attributes of the product. These are as follows:

- **Price**: what is the price being charged for the product and does the company seek to minimize it (cost driven) or seek to offer something more in order to offer value and motivate a higher price (value-driven)?
- **Quality**: how well does the company want the product to perform, what is meant by quality (metrics used or aspects that define quality), and what is the focus of quality (what does the company want to excel at or improve)?
- **Choices**: is the value proposition being offered as a standard solution to all customers or does it have different offerings depending on customer segments or features? Can the value proposition be customized and if so, how and when is it customized?
- **Image**: what kind of image does the company seek to create and what kind of relationship does it wish to have with its customers? Does the company want to be seen as "good design" and therefore invest in the design of packaging or does it seek to have standard designs that will minimize the production costs? Does the company want to have direct and personal relationships with the customers or does it seek cheaper self-service solutions?

8.3.2 Value Proposition in the Digital Era

Products are being innovated with the aid of digital technologies. Porter and Heppelmann stated that "all smart, connected products, from home appliances to industrial equipment, share three core elements: physical components (such as mechanical and electrical parts); smart components (sensors, microprocessors, data storage, controls, software, an embedded operating system, and a digital user interface); and connectivity components (ports, antennae, protocols, and networks that enable communication between the product and the product cloud, which runs on remote servers and contains the product's external operating system)"[66].

The seamless integration between physical and digital has reinvented everyday products such as vacuum cleaners and lawn mowers. Smart refrigerators have been enhanced with digital solutions that can assist in composing grocery lists and remind us about expiration dates. The integration of physical and digital is not restricted to household products. Health and activity tracking devices are integrated with wristbands, rings, and shoes. Clothing is also integrated with digital solutions. Smart pants and shirts track posture and body position to improve for instance, yoga, running, and golf. External sensors can be attached to enable digitalization. For instance, sensors can be installed that track temperature in the house. The logistics industry has benefited greatly from attachable devices. GPS sensors can be used to track packages. Likewise, monitoring of transportation vehicles is made possible by similar solutions.

Services have also been innovated with the aid of digital technologies. The core of "smart" is data that can be collected and analyzed. Data analysis has changed and helped improve the service companies can provide for their customers. Instead of one-time purchase and after-sales service triggered by the customer, companies can remotely monitor the product and take preventive measures to avoid issues before they appear. For instance, software can be updated remotely in cars. If physical repair is needed, the mechanic will know the issue and work on it rather than spend time on diagnosis [66]. Digital technologies can add services to products. Caterpillar sell services that enhance its construction machines by recommending actions that can be taken to optimize the workflow. Such paid services recommend for instance where to assign more or less equipment, and how to reduce fuel [67]. Another example is the smart collar for pets. Such collars record the activity of the pet and can track its whereabouts. The data is accessed with a mobile app. However, if the owner wishes to access the data or enable tracking in case the pet gets lost (using GPS), he or she has to pay a monthly subscription fee [68].

Another type of subscription model is product-as-a-service. Product as a service allows customers to pay a regular fee rather than an upfront sum for a specific product. The reoccurring fee can be based on for instance time units or usage. The customer gains value as they don't need to pay an upfront sum and costs of maintenance. For instance, in B2B lighting industry, companies buy light bulbs which needs to be replaced. This incurs costs of purchase and maintenance that have to be managed in-house. With a product-as-a-service model, the company will pay a monthly subscription and the providing company will take care of replacing the light bulbs whenever needed. For the providing company, this is a good solution because they secure repeat sales by means of subscriptions. It becomes a win-win situation.

Digitalization of value propositions put new demands on business analysis. The analysis of products and services must include the digital components. The product is no longer the physical thing or the service but the package of all components. The complexity of the package increases. An analyst should understand the basic structure of digital products (physical, smart, and connecting components), and how services can be attached to the product. Such an understanding allows for further refining and innovating products and enhances existing value propositions with even more value. Digital products are evolving fast and the analyst should keep up with the pace. Failing to have a finger on the pulse of digital value propositions, can render solutions developed inadequate and out of date before they reach the market. Analysis of value proposition in the digital age must take a holistic view rather than just the core product.

8.3.3 Persona Analysis

Solutions or products are developed to create value for the customers or end users. If one loses this perspective, one might indivertibly be guided by what one thinks the customer wants. This kind of tunnel vision often result in solutions becoming

technically advanced but not necessarily user friendly. When software solution development began, it focused on the technical aspects of the solutions. As business analysis progressed, value delivery became more prominent. Now, with the emergence of digital solutions with an increased presence of web-based solutions, the perspective of the customer is an absolute necessity.

Previously, we discussed the business model analysis and the business model canvas. The customer segment of the canvas is one of the main building blocks of any working business model. If the customer is not known well, how can a company expect to deliver value that satisfies the customer? Likewise, when marketing people develop content and determine strategies, they rely on customer segments to ensure that the "right" message is delivered to the "right" audience via the "right" channels.

Persona analysis [69] (also sometimes called user personas, customer or buyer personas) allows for better understanding and knowing about the customers. Persona and stakeholders differ in that more information is gathered about a persona. For a stakeholder, it is enough to know how they will be affected and what they wish to achieve. A persona goes deeper than that. With personas, we get to segment the customers and get to know each one of these segments in more detail. A persona is not a real person but rather a hypothetical average "person" of a customer segment. Therefore, a persona is representative of a larger group of users that share attributes. The analyst will develop personas when it is important to have a better understanding of the customer.

In capturing a persona, it is good to make it as real as possible and bring the person to "life" via interviews or workshops. A fictional name is given, and a picture is chosen, information about where the person works, and the kind of job they do are also noted. In addition, basic data about demographics such as gender, age, salary level, work location, home location, education, and family are collected. If it is possible, the behavior of the person in regard to the product is also captured. If required and possible to do, data about goals, challenges, values, fears and other softer aspects are gathered as well. The person, although not real, now feels very real and tangible. Such an in depth understanding of the customer allows the analyst to consider the customers' perspective much better.

When developing personas, it is important to keep the number of personas to a manageable amount. It is worth bearing in mind that the main customer segments are in focus, not every customer. The personas will not capture every type of customer but rather, capture the majority. There is no set rule or method defining how to develop personas. The drawback to this is that it might pose a challenge when doing it for the first time. However, that allows for being very flexible. Although there are no set guidelines, there are a few components that are important to produce relevant personas.

8.3.3.1 Research Based Personas

Firstly, in any attempt to develop personas, user research must be conducted. The personas are supposed to be well grounded in data. There is no point in creating

personas from our imagination or what we think might be a group of customers. In this process, we are mainly looking for the following aspects:

- **Who is the customer**: Age, where they live, gender, education level and in which field, job title, average salary and so on?
- **Environment they are in**: What kind of devices do they use, when and where do they use the product or service and so on?
- **Tasks**: How are they using the product or service, what kind of tasks they perform when using the product or service, and how often are they using it?
- **Motivation**: Why are they using the product or service or what are their desired outcomes or what do they expect to achieve?

The personas are supposed to be a research-based representation of a customer group where the underlying data is of utmost importance. One main source is customer surveys. Surveys can be formed in different ways, but the main issue is to ask questions that will give an insight into your customers' mind. The questions will vary depending on the industry, context, and company but will have the same goal, to gain information that can be used to develop the personas. Data can also be gathered through web surveys. These surveys are given to the customer at certain times and ask questions with multiple choice answers. Another source of data is in-depth interviews with customers conducted over phone or in person. Perhaps one of the most valuable sources of data is on the Google Analytics site. At times, it will even be possible to segment the customers based on revenue, transactions, repeat, or newly signed up and returning customers. This data backed up with surveys and qualitative data, provides a solid foundation for developing research-based personas. There comes a point where there is too much data and it is necessary to condense the research by filtering out parameters that are relevant for the product and its users. Once the data is gathered and analyzed, one can begin to form preliminary personas. Initially, they might have some imperfections, but commonalities soon begin to emerge. Iteratively, and in discussions with others, personas start to appear and can be personalized. This simply means to describe the personas by capturing their background, demographic data and other aspects described above.

With the required data to hand, discussions in workshops take place in order to identify the personas. This is naturally an iterative process. It is important to add a photo and a name (or nickname) to the personas to make them seem real (see Fig. 8.4).

In developing a business model canvas for start-ups, Steve Blank [70] recommends taking the product concept and testing it in the real world. This means that the researchers should go out and meet people in the streets, show them and explain about their product or service, ask questions and get to know what potential customers like or dislike. In this process, they will learn about their potential customers, what pains they have, what gains they are seeking, what services they are willing to pay for, and who they are in terms of gender, age, where they live and so

Fig. 8.4 Example of a persona

on. In this process, the customer segments are identified, or in other words, the customer's persona.

There are no set rules of how to represent personas. There are many different templates and variations to what information is captured. Most commonly and perhaps the minimum is the information previously discussed. This information is used by the analyst and developers to better understand how Fredrik would think and what features he cares about and values. The development of the solution becomes therefore, user-centric.

Alan Cooper [71], who was among the first to introduce the concept of personas, offered the following tips on developing effective personas.

- The personas have to be well anchored in reality. As such, there is very little value in making up personas.
- Personas should be specific, as if it was a real person. Generic personas cease to be effective. When developing a product, it is easy to adapt the persona to the requirements if the personas are too generic. Having specific personas will make it difficult to assume characteristics in the personas to fit the requirements one thinks is needed.
- Capture the desired outcome of the personas. If the persona's goal is known, it is easier to determine what should be included and what should be excluded.
- The personas should be significantly different from each other. Their overlap should be minimal. Focus on designing "primary" personas. These are those who must be satisfied. A primary persona is that persona whose needs can be fulfilled by a single interface.
- For smaller projects, one primary persona is enough. Larger projects would require three primary personas. However, if the primary personas are more than three, it is most likely worth working on further optimization.

It should be noted that Alan Cooper introduced different categories of personas. Primary persona are the most essential ones but there are also secondary, supplemental, customer, served, and negative personas.

8.3.3.2 Customer Journey Map

The descriptions discussed so far concerning the product or service, take the perspective of the company. These models do not say much about the perspective of the customer. A customers' journey map can be complementary in this regard. Such a map captures the different interactions the customer has with the company and therefore, captures the "process" from a customer's perspective [72]. In other words, it is the overall story of the customer, beginning with the initial contact until the customer no longer has any interaction with the company. It tells the story from the customer's perspective and visualizes it as a process or map.

As it captures the viewpoint of the customer, customer journey maps can be applied on essentially every type of product or service from any industry. Considering that the customer experience is a very important aspect of products and services, customer journey maps can be used to better understand and analyze user experience and the process from a customer perspective. Although customer journey maps are mostly used within the domain of marketing and user design, they also have merits in other areas. It can be a powerful tool in understanding why there is customer dissatisfaction. A customer journey map can show where there are inefficiencies or pains to the customer. Such a map can be used to highlight when customers need to switch between different devices in consuming a certain product. Furthermore, such maps can show when customers are being routed to different departments or channels within the same company. The main components of a customer journey map are as follows:

- **The customer**: The customer is the actor or the main character in this story. The customer should be clearly defined. There is a difference between a business to business customer and a private customer. These will have a different story. A suggestion is to use "personas" i.e., a fairly detailed description of an actual or typical customer of a specific segment.
- **Scenario**: The map should describe a certain scenario. It could be the existing situation, or it could be a desired situation that the company wants to achieve. It could also be for an existing product/service or for a new product. In this scenario, it is also important to capture the customer's intention or goal, i.e., why the customer is embarking on this journey.
- **Interactions**: A customer journey map must include the interactions or the touchpoints the customer has and via which channels (mobile, web, physical store).
- **Actions and sentiments**: A customer journey map should also capture what the customer does along this journey and what sentiments or emotions they have during these steps.

Although almost all customer journey maps have the same elements, they look very different. There are no rules on how to visualize or present journey maps but a quick search on the Internet reveals many different ways it can be done. An example is presented in Fig. 8.5.

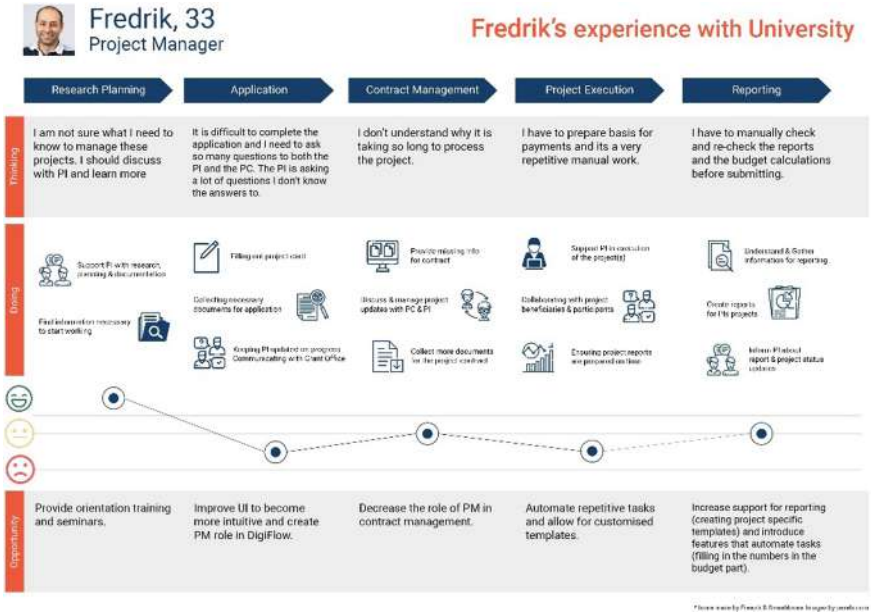

Fig. 8.5 Example of customer journey map

When mapping the journey of the customer, it is important to base the results on as much data as possible. If the input for the map is based on the analyst or domain experts understanding of the customer journey, the risk is to actually not capture the customer journey as much as capturing what the company thinks the customer does. Considering the elements listed above, the main process for creating a customer journey map is as follows:

1. Create customer personas capturing the typical customer of a segment that is in the focus for the mapping.
2. Align the company (process) goal with the customer goal. For instance, a customer might have the goal of "subscribing to a service" which is aligned with the company goal of "selling subscriptions." The idea is to make sure the goal of the customer is relevant for the company.
3. Describe the customer journey by decomposing their journey into activities. At this stage, it is very important to use data, in particular quantitative data.
4. Identify interactions and channels of the customer with the company.
5. Visually represent the customer journey map.

One very common challenge when working with customer journey maps is determining the right level of detail. A too detailed description allows for richness but at the expense of getting an overview of the whole experience. One should also not underestimate the time it can take to create a proper customer journey map.

Customer journey maps can be enhanced with analytics to increase the accuracy and usefulness of such maps. Most digital companies use more than one channel. Automated tools collect and analyze data from all channels, thus saving much time. In addition, data-based insights make maps based on actual interactions rather than opinions. Customer sentiments can also be analyzed by analyzing comments, likes, shares, and words used when commenting [73]. Relevant data can be collected from call center logs, point of sales systems, e-commerce platforms, websites, social media, and review sites [74]. Collected data is analyzed and the customers' journey is automatically mapped. The maps can be used to closely examine the journey of most satisfied and dissatisfied customers, which journeys generate highest revenues, and the quickest and slowest interaction paths to identify bottlenecks [75]. In addition, measures relating to customer churn, conversion rates, repeat purchase rates, and other metrics can be derived.

Digital solutions have a stronger focus on the customer. Traditional process analysis oftentimes focuses on the internal processes of a company and seeks to optimize them. However, as customer experience becomes increasingly critical to success, optimization must be considered from the perspective of the customers as well. This is where customer journey maps play an important role. For an analyst, it is important to incorporate the customer perspective in analysis of current and future state. The solutions examined must not fall short of considering the customer perspective. As seen, customer journey maps can be done in different ways on a scale from simple (interviews) to advanced (data-driven analysis). The approach will depend on availability of data and tools. Nevertheless, the analyst must incorporate analysis from the perspective of the customers, in particular when working with digital solutions.

Chapter 9
Business Processes

Organizational charts show the formal structure culture could be said to be the invisible space between the boxes and lines of an organizational chart. The capability map gives an overview of "what" an organization does in these "boxes." The business model, as discussed previously, depicts the key parts or different building blocks that are necessary for making the business model work i.e. creating value and delivering it to the customers. However, the business model does not show how the different building blocks are linked together. Understanding how an organization creates value by linking the different parts is equally essential. However, the structure, culture, business model, capability map or the stakeholders do not explain "how" value is created by the organization.

Business processes explain "how" the organization does the work. In other words, business processes describe what triggers a specific process, the activities executed, the data objects used and produced, the resources (who) that perform the work, and the outputs produced by the process. Consider the process of acquiring goods/services (procurement). Most companies have procurement as a capability that involves buying raw materials and other goods and services. However, the question of how goods/services are actually bought is not captured in the capability map. That is where the business processes come into play. A closer look at the procurement process would perhaps reveal that there are a set of activities dealing with invoices such as examining, accepting or rejecting, registering, and issuing payments. Business processes are not that straightforward but are complex and the procurement process might have different processes for different cases. Perhaps a company has a specific set of activities when dealing with purchasing often used goods such as raw materials. On the other hand, they might have a different process for acquiring office equipment.

Procurement is not the only process at a company, there are many more and we will examine how to get an overview of a company's processes, and how we can model and analyze business processes.

Organizations, be they nonprofit, governmental or private, operate in an increasingly competitive and changing landscape. In order to gain or maintain their

F. Milani, *Digital Business Analysis*,
https://doi.org/10.1007/978-3-030-05719-0_9

competitive edge, they constantly seek to improve their efficiency. It is essential for organizations to constantly evaluate how they create value and identify opportunities for improvement if they are to reach higher levels of efficiencies. A means to this end is by focusing on the value producing processes of an organization. Such approaches and methods fall within the **Business Process Management (BPM)** field.

9.1 Business Process Management (BPM)

A business process can be defined as a set of activities that together produce the desired outcome or a business goal. BPM on the other hand, is "the art and science of overseeing how work is performed in an organization to ensure consistent outcomes and to take advantage of improvement opportunities" [76]. When embarking on a BPM life cycle, organizations need to first ask what processes they currently have (process identification). Organizations commonly have an order-to-cash process that covers the process from which an order is received until the ordered product or service is delivered. Within BPM, the aim is to manage the business processes. There is limited value in working with all business processes at the same time. Rather it is better to focus on a few processes, preferably those that are at the core of the organization and where improvements result in the greatest benefits for the organization and its customers. Therefore, the next step is to understand the selected business processes in more detail. The order-to-cash process of an insurance company will most likely include steps such as registration, issuing an insurance, creating an invoice and registering premium payments. Each of these steps can be further detailed to such a level where further detailing of the steps does not add any further value. The work that is performed to graphically capture business processes as models is called process discovery.

Once these business processes have been described as business process models depicting the current situation (also called as-is process models), they are analyzed (process analysis) and inefficiencies, waste and opportunities for improvements can be identified. The insurance company mentioned above might notice that many customers contact the company to get insurance but do not complete the process (i.e. do not become customers). Further analysis might reveal that the customers provide the required data, but it takes two days before their requests are approved. While waiting, the customers find other insurance companies that offer them insurance faster. The more detailed analysis might further reveal that the delay is because one department receives the requests and another department processes them.

After the process analysis, the as-is process models are modified or re-designed to depict the desired state (also called the to-be process models). The insurance company might decide to have the same department process all insurance requests. These changes can then be implemented in the business processes of the organization. Finally, the performance of the business process is monitored, and further

improvements or adjustments can be made as they are identified. Process models play a vital part in BPM and the process models will be the main artifact for discovery, analysis and conceptual modifications or re-design of business processes. For digital business analysis, it will be key to consider how digital technologies can enhance process performance, to use such technologies to innovate processes rather than serve as a technology substitute and be prepared to model processes of systems rather than businesses.

9.1.1 Process Architecture

An organization has a set of high level processes [77]. Smaller and mid-sized organizations usually have about 10–20 main processes whereas larger organizations might have 40 or more. The number can depend on for instance type of industry but also how main processes are defined. Most companies within the same industry will find many similarities. For instance, airline companies will have a set of main processes that is more specific and common to the industry. Therefore, organizations have created reference models where they enumerate the processes most commonly identified per industry. ITIL[1] (information technology infrastructure library) provides a reference model of processes often found in IT service providers. Similarly, SCOR[2] is used for organizations that have supply chain management as part of their main business. In addition, APQC[3] (American Productivity and Quality Center) provides similar reference models for a wide range of different industries.

The representation of the main processes of an organization captured graphically, is the process architecture. The process architecture can also be called the process map, process identification or process landscape. Regardless of the name, its main purpose is to depict the main processes of an organization and their relationship to each other. As an analyst, it is important to understand which processes are going to be affected by the change initiative being worked on. Not only is it important to know which processes are involved but also how they relate to other processes. As such, it is beneficial to have an overview of the process architecture. It should be noted that process architecture extends beyond the initial listing and illustrating the main processes of an organization. It entails the further decomposition (detailing) of each process until a level is reached that meets the needs of the organization. As such, process architecture is perhaps the first level of a series of levels or process models where each level captures the processes in greater detail. This is referred to as process model decomposition and will be discussed later.

[1] https://www.axelos.com/best-practice-solutions/itil.

[2] https://www.apics.org/apics-for-business/frameworks/scor.

[3] https://www.apqc.org.

9.1.2 Process Enumeration

Larger organizations have often made efforts to represent their process architecture. If available, they can be of use for the analyst. However, if it is lacking and there is a need for one, the analyst can assist. The purpose is to identify which processes matter for the issue at hand and to be aware of its relationship to other main processes. For this purpose, it is sufficient to get a rough overview of the process architecture. Most commonly process architectures are developed in discussion with domain experts. Such exercises are similar to working with capability maps and have value by creating a common understanding and an overview of the organization among the stakeholders. However, in enumerating processes, it is useful to consider the following suggestions.

- Search the web for similar process architectures and see how they have been categorized, organized, named, and defined. This is a good start.
- Use the framework of the core, support, and management processes (see Sect. 9.1.3 for more on this topic) as it is the most common way of organizing processes.
- Use reference models when working on process architectures. Reference models are the collected learning from many organizations and have great value. One can begin with a relevant reference model (generic or industry specific) and pick the processes they consider relevant for the organization. One can also create a draft of the process architecture and then compare and contrast it to reference models in order to verify and improve the draft.
- Bear in mind that certain processes will be domain specific i.e. they are specific to the industry in which the company operates. Airline industries will have a set of processes that do not occur in the banking industry and vice versa.
- Consider the scope (size) of the process. When enumerating the processes, it is important to keep the scope of each process clear and manageable. A process with large scope will be difficult to work with and it will be unclear what the process encompasses. On the other hand, if it is too specific, the architecture will contain many processes, making it overly complex.

When working with enumerating processes, the following guidelines and questions can be helpful in determining the scope of each process:

- **Start of the process**: it is almost a necessity to know where the process starts and what triggers the start of the process.
- **End of the process**: equally important is to know what marks the end of the process or what is achieved when the main process is concluded.
- **Inputs and outputs**: a process will require some form of input that transforms it in its process of creating an output. Defining these inputs and outputs is also very helpful.
- **Process owner**: the process might have an owner (the person responsible for the maintenance and development of the process). If that is the case, it can help in

scoping the process. If there is no dedicated owner, it might be helpful to consider the scope of the process if one would want to appoint an owner.

- **Key participants and stakeholders**: discussing the key participants and stakeholders of the process group usually assists in clarifying the scope. Participants are those who actively are involved in creating the value whereas key stakeholders are those who have expectations on the results or on the process.
- **Customers**: considering who the customer of the process is i.e., for whom the process delivers value (internal or external), is another question to consider when scoping.

9.1.3 Core, Support and Management Processes

The most common way to categorize processes of an organization is in core, support or management processes [78]. The core processes are those that directly create value for the external customers of the organization. These are the processes that are at the core of the company. These processes generate revenues as they produce a value that customers pay for. Examples of core processes would typically be product development, manufacturing, customer service, marketing, and sales. Naturally, core processes vary but their common denominator is that they create the value sold to customers. Core processes are enabled by a set of supportive processes, often referred to as support processes. Support processes do not produce direct value to customers, nor does the customer pay for any of the services the support processes provide. However, they are essential for the core processes. Support processes are internal ones needed to make the core processes function. HR (human resources) is a support process because if there is no management of the human resources, no one would be producing value in the core processes. Another example is IT support. These processes enable core processes to execute and thereby deliver value. Other examples of support processes are finance and accounting, and legal processes. Sometimes the management processes are also included. These are the processes by which the high-level management response to environmental influences and trends, determines objectives and develops strategies to achieve the objectives. Examples of such processes would be strategic planning, compliance and risk management, and budgeting. The analyst can use core, support, and management processes to categorize and structure the process architecture (see Fig. 9.1).

9.1.4 Business Process Hierarchy

We have already discussed the process architecture and the core processes. Now we take a closer look at how we can model these. Each main process of process

Fig. 9.1 Core, support and management processes

architecture's first level (or the process landscape/map) is commonly represented with rectangular shapes. These are also referred to as process areas, commonly organized as core, support, or management processes.

Each process area commonly consists of several process groups i.e., main processes that together deliver the objectives of the process area. A company might have a "develop business strategy" as a process group. The main processes of this group are to "evaluate strategic options", "develop organizational goals", "formulate business unit strategies" and so on. Up to this level, the processes are represented as separate and independent processes. However, as these are decomposed (modeled in more detail), their internal relation is also captured. Each one of these main processes has a set of ordered sub-processes. These sub-processes are like chains of sub-processes that create value and are therefore connected to each other. Each of these sub-processes is then decomposed and modeled in further detail until one reaches the level where the individual atomic activities and tasks of the process are represented (see Fig. 9.2).

When working with process architecture and hierarchies, it is easy to get carried away and model too much. As an analyst working on a specific issue, too much modeling will be waste of time and resources. The analyst should model the processes that are relevant to the issue at hand. That might mean that a rough overview of the process groups is developed and then only one or perhaps two of the main processes are modeled in further detail. It is better to model what one considers to be needed and to model additional processes if and when needed.

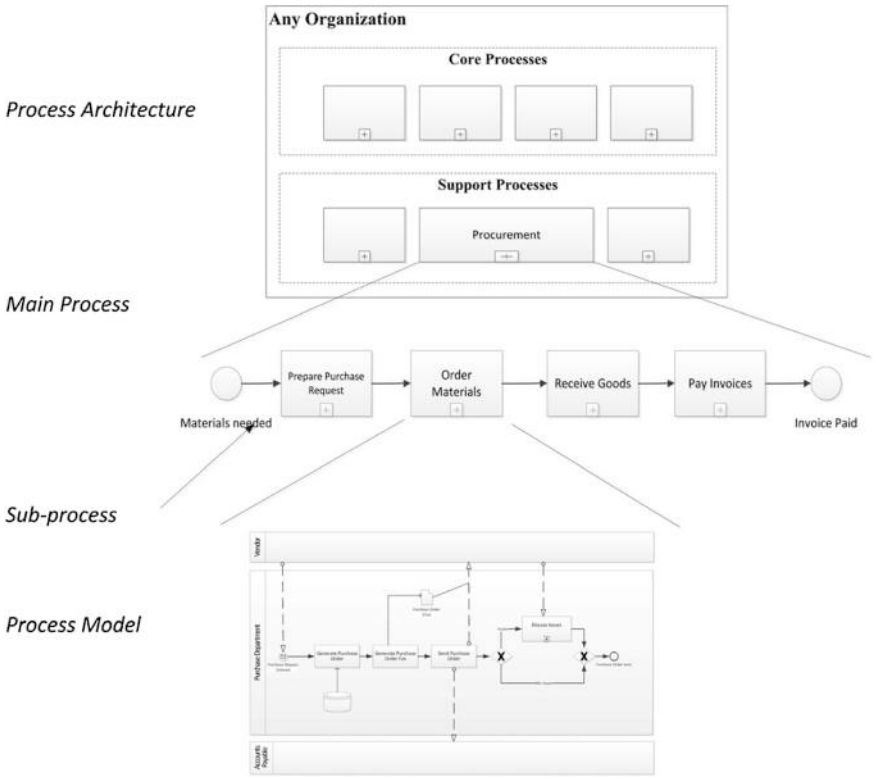

Fig. 9.2 Generic example of process architecture

9.2 Value Creation Process

As discussed earlier, a business model or a capability map does not show how different building blocks or capabilities are linked together. Understanding how an organization creates value by linking the different parts is equally essential and this aspect is captured by means of processes.

9.2.1 The Value Chain

To understand the links between different parts of an organization and how they create value is to perform a value chain analysis. The concept of the value chain was introduced by Porter [79] and is widely known. The idea is to show how goods are moved through an organization and how each part adds value (see Fig. 9.3).

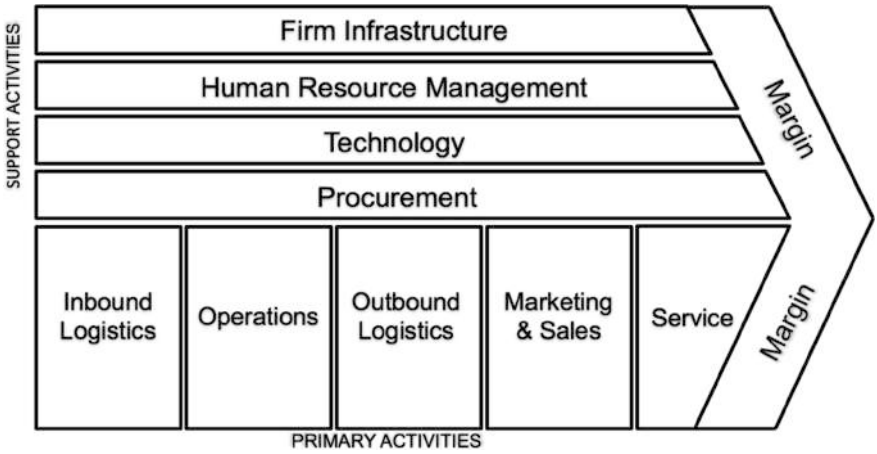

Fig. 9.3 Value chain

The main contributors or the "primary activities" are those that directly are involved in creating value. These are as follows:

- Inbound logistics, which refers to getting raw materials to an organization such as receiving, warehousing and inventory management.
- The operations add value by transforming those raw materials into products.
- The outbound logistics is getting those products into the hands of the customers such as order management.
- Marketing and Sales add value by marketing and managing the sales of the products including advertising, channel selection, and pricing.
- Service concerns the after sales management of a product such as warranties and repair services.
- The primary activities cannot be executed alone but need help from the following "support activities."
- Procurement deals with providing all the things that an organization needs to carry out its primary activities such as procuring machines and equipment.
- Technology Development concerns R&D, new product development, and innovation, processing automation, development and maintenance of information systems supporting operations or the marketing.
- Human Resource Management is about ensuring the human resources required for all the primary and supportive activities are under control.
- Firm Infrastructure refers to activities to manage the legal and financial activities required for an organization to be able to operate.

The margin stands for the difference between the total value received for the products (revenues from sales) after all costs for primary and support activities have been deducted. This is the profit of the company.

The first three primary activities (inbound logistics, operations, and outbound logistics) are analyzed and improved within the domain of the supply chain management. Marketing & sales, and service fall more under the domain of customer relationship management. Note that outbound logistics links these two fields of process management. Enterprise resource management (ERP) encompasses the support activities of the value chain.

Once the value chain of an organization has been mapped, the primary and supportive activities can be further decomposed for the purpose of identifying those that create value and those that do not. Following this, an analysis shows which activities contribute to the competitive advantage of an organization and where measures can be taken to strengthen these advantages. If the value chains of the suppliers of an organization and the buyers (customers) are also linked to an organization's value chain, then the larger streams of activities form a "value system." It should be noted that the value chain was primarily designed for manufacturing firms, but the main ideas are also applicable to other types of organizations. In such cases, one can use the generic value chain provided by Porter and identify the relevant firm-specific activities that apply to the organization in question.

Porter developed the value chain in the mid 1980s when major corporations were manufacturing firms dealing with physical goods. The value chain is focused on the movement of physical goods. However, since then both service providers and digitalization has emerged and become the mainstream. As such, the original value chain is not as widely applicable as it used to be. Nevertheless, the value of considering the chain by which a company produces and delivers value is still relevant.

9.2.2 CRISP-DM and Data Value Chain

In the digital era, data is the foundation for understanding the current state and to draw insights that can be turned into revenue generating opportunities. However, it is not that simple to work with data. To this end, the framework called CRISP-DM (Cross Industry Standard Process for Data Mining) has been developed to lend structure to data analysis. The CRISP-DM framework is a well-established analytical methodology and is generic to suit a cross industry application (see Fig. 9.4). Although it was introduced in 1996 and some parts might be outdated, its general outline is still valid and relevant as is used as a high-level framework for data mining projects.

The CRISP-DM framework depicts six phases for data mining projects [80]. The phases are not rigid, allowing for adaptability when needed. Naturally, data is at the core of the framework. The outer cycle captures the cyclical nature of data mining processes i.e., deployment leading to new and more focused business questions that in turn, lead to new data mining projects. In the first phase called "business understanding", business objectives and requirements are explored and translated

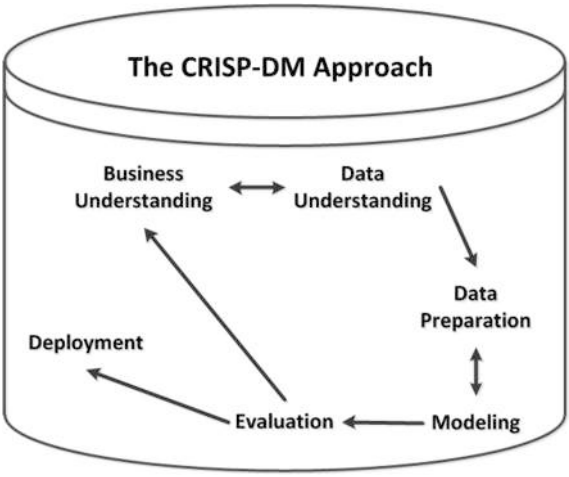

Fig. 9.4 CRISP-DM framework

into data mining problem definitions. The next phase, "data understanding" is about data collection and diagnosis of data quality. Next comes "data preparation" where raw data is cleaned and the data set that is to be used is constructed. Once this has been done, "data modelling" is conducted. In this phase, data is analyzed with the aid of various data modelling techniques. It is preferred to use several different tools and techniques on the same data set to gain a more complete understanding. In this process, it is common that the final data set is formatted several times so to better fit the various techniques used. The "evaluation phase" encompasses the work of ensuring that the generated models meet the business objectives previously set. The final phase is "deployment" which can result in different solutions. The deployment can range from simple reports to implementation of complex systems.

For an analysts, it is important to be aware about data mining frameworks. In the digital era, an analyst will most likely be exposed to data mining projects. It is therefore important for an analyst to be able to navigate within such frameworks. Business analyst can contribute during the definition of business objectives and requirements, data understanding, perhaps even in data preparation, and during the evaluation phase.

When working with data-centered initiatives, the project management of such initiatives must be managed. CRISP-DM catered to those needs. However, if data is to be used effectively, one must consider how the data transforms or evolves as it is used. The concept of value chain for data can be applied in this context. A data value chain can help with aligning a project with a chain of activities to enable valuable use of data. The concept of data value chain is usually applied on larger sets of data (big data). Nevertheless, the basic elements of the data chain are general enough to be applied on varying sizes and types of data used for analytical purposes (see Fig. 9.5).

Although there are several versions of the data value chain, most include activities that can be grouped as data collection and preparation, data management

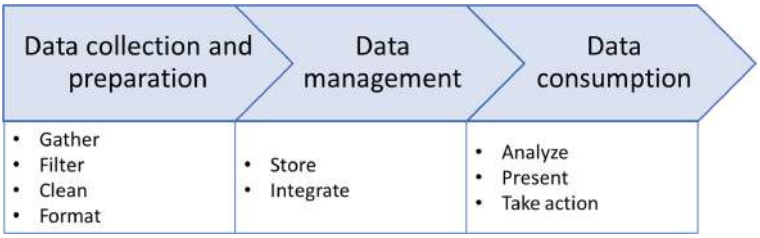

Fig. 9.5 The data value chain

and data consumption. Data collection and preparation refer to preparing for storing and using by gathering, filtering, cleaning and formatting the data [81]. The data should include as few missing or incorrect data as possible. The data should also be in a format that is accepted by analytical tools. Furthermore, the data must allow for being integrated with existing data [82]. The better the shape of the data, the easier it is to manage it and the higher the quality of the results. For example, AEGIS provides a big data value chain platform for public safety and personal security [83]. In their automotive and road safety project, they apply the value chain on structured and unstructured datasets that are gathered from vehicles, maps, social media, and weather channels [83]. Such a variety of sources and types of data requires a substantial amount of pre-processing to make the data usable on a single data processing platform. They, therefore offer advanced services such as data cleansing, integration and semantic data linking [83]. The value cannot be derived from data unless it is compatible to the platform standards.

During data management, the data is organized in its context in terms of storing and integration. Data should be managed in a scalable way [84]. This is achieved by optimizing databases as well as the data flow. It can be enhanced by consistency of identification vocabulary and data storing units. Methods such as data flow analysis and data dictionary might become useful in this regard. Standardized ways of storing the data will reduce the time needed to access the data through applications and increase the quality of the results of the analysis. Another important aspect in data management is security. The AEGIS automotive and road safety project handles personal and sensitive data. Even though part of their data preparation is anonymization, they take additional measures to ensure the privacy by for instance, storing some of the data at the source [85].

Data consumption usually encompasses a set of activities that most often are used by analysts. The first important step in data consumption is analysis. It means exploring, transforming, and modeling data as well as highlighting the findings [84]. The discovery of previously unknown information is often at the core of data value creation. However, the data value chain does not end here. The insights gained must be transformed into a presentable format that is understandable by decision-makers. This is mainly achieved by means of reports and visualizations [82]. The data value chain will only deliver value when its output is correctly understood and used as basis for actions. The automotive and road safety project

provides three types of analysis—information about damaged roads, calculating individual driving risk score, and estimating regional driving risks [83]. The users of such information are drivers, city planners, and road maintenance departments [83]. Every user group has various interests and therefore requires overview of different aspects of data. Therefore, AEGIS provides a separate analysis dashboard for drivers and city planners [83].

9.2.3 SIPOC

The value chain illustrates how the different parts of a company are linked to the work of producing value. However, it does not show the main sequence of activities required to create and deliver its value proposition. The SIPOC model [86] captures and documents a business process from the beginning to the end as a table (see Fig. 9.6). SIPOC stands for "suppliers", "inputs", "process", "outputs", and "customers."

The name is quite self-explanatory. Suppliers are those who deliver raw materials or products an organization needs. Inputs are what they deliver (their value proposition). The process covers the processes an organization has for producing their products. Outputs are the actual products and finally, customers are those who buy the products (outputs). There are similarities with the value chain but SIPOC takes a more process-oriented view. SIPOC does not give a detailed understanding of each step of the processes but rather an overview.

The main difference between SIPOC and Value Chain is that the Value Chain focuses on the "P" of the SIPOC and models the value chain of the "S" and "C" separately. These separate value chains would then form a value system.

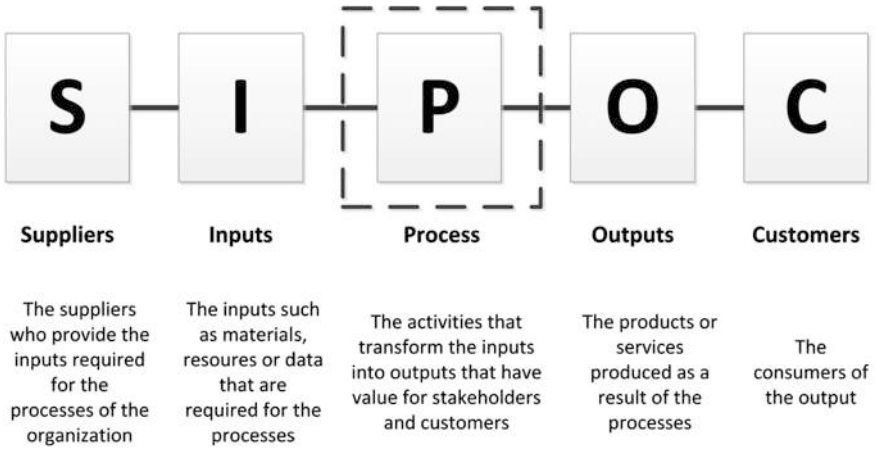

Fig. 9.6 SIPOC model

9.2.4 Value Stream

A value stream depicts the end-to-end collection of activities or major tasks that satisfies, or even better, delights the customer [87]. A value stream captures the steps required to take a raw material and transform it into a product or service that can be delivered into the hands of a customer. It should be noted that the value stream is tightly connected to the "lean philosophy" and as such concerns manufacturing firms. However, it can still be of value for non-manufacturing aspects as it helps the analyst to consider additional aspects. When capturing the value stream or the main steps of a specific process for the purpose of gaining a better understanding of the context, it is important to bear two things in mind. First of all, the value stream is stakeholder focused. This means that at the end of the process there has to be a stakeholder, such as a customer. All the main steps being captured should move things forward from the perspective of the stakeholder. Secondly, the idea is to take a holistic view and as such the value stream should be at a high level and disregard the details. The details are captured if it is further decomposed into more detailed descriptions. As such, the main processes should be captured in such a way that they can be further decomposed where each sub-process might have different stakeholders. It is, therefore, important, to begin with external stakeholders (customers) at the highest level, and to include the internal stakeholders when the main steps are further decomposed.

The value chain focuses on how value is created in a company by linking the main processes as a chain. SIPOC considers the parts that are outside of the internal processes of the company by including suppliers and customers. Value streams take a more holistic perspective by focusing on the whole process. Although analysts mostly work with value chains, it is highly beneficial to consider the suppliers and the customers and focus on the whole chain by beginning with the customer (internal or external) and ending the processes with a customer.

9.3 Modeling Business Processes

In order to understand the business processes, we need to examine, investigate and represent them graphically or, to model them. The work of modeling a business process is referred to as "discovery." In this section, we will discuss modeling processes at different levels of hierarchy, the language and notation by which we capture process models, and finally how we capture discovered process models.

9.3.1 Modeling the Main Business Process

Main processes capture a process at a fairly high level and therefore, do not go into details. They do not capture the variability that might exist, such as differences in

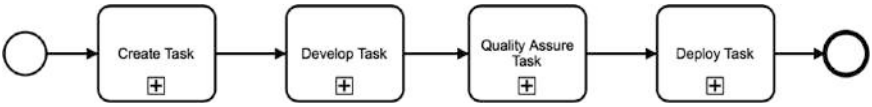

Fig. 9.7 Example of a main process

how the process is executed depending on product or customer. At this level, such details are intentionally not represented in order to keep the models simple, easily understandable and to allow focus to be on the chain of sub-processes. As such, the relationship between the sub-processes is straight as the Fig. 9.7 depicts.

Note that the sub-process is modeled using a rectangular box with a plus sign. This is the notation used by BPMN and marks a sub-process (the plus indicating that this process can be "opened" to see a more detailed description). An activity that cannot be further decomposed lacks a plus sign meaning that there is no further detailed description. However, as the main process is on a high level, we use sub-processes and as such, the plus sign is present.

When modeling the main process, the key is to figure out how to chunk it into smaller parts (sub-processes). The work of dividing a process into its components (sub-processes) is referred to as "process decomposition." There are a few principles one can follow when determining where to "cut" the main process (decompose it). The analyst will be wise to consider which of the principles to use for each "cut" as one size does not fit all.

The perhaps most commonly used principle in decomposing processes, particularly when discussing with domain experts and business representatives, is "breakpoint" heuristics, which means that decomposition is made at points representing natural phases of the process towards the fulfillment of its objective. The process can be cut at points where sub-goals of the main process are achieved or at points where two sub-processes have distinct themes and therefore are logical milestones or separate functions in the process. In essence, breakpoint-driven decomposition aims at separating sub-processes at those points where it makes sense and is logical from a business perspective.

Another way to decompose a process is by looking at the data objects each part of the process uses or produces. Such object-based heuristics assume that activities sharing common objects belong together and thus should be in one sub-process. These approaches consider the objects as the primary driver for decomposition decisions.

Figure 9.8 depicts a simple process that uses and produces a set of data objects. As can be seen in this illustrative example, activities A, B, and C use and produce documents 1, 2, and 3 more, when compared to activity D. A data object-based decomposition of this process would put activity A, B, and C into the one and the same sub-process as these share data objects and therefore, more naturally belong together. Activity D, on the other hand, will be placed in the following sub-process.

Let us look at the process in Fig. 9.9. We see a series of tasks for developing an enhancement to a software system. The process begins with registering a task, then

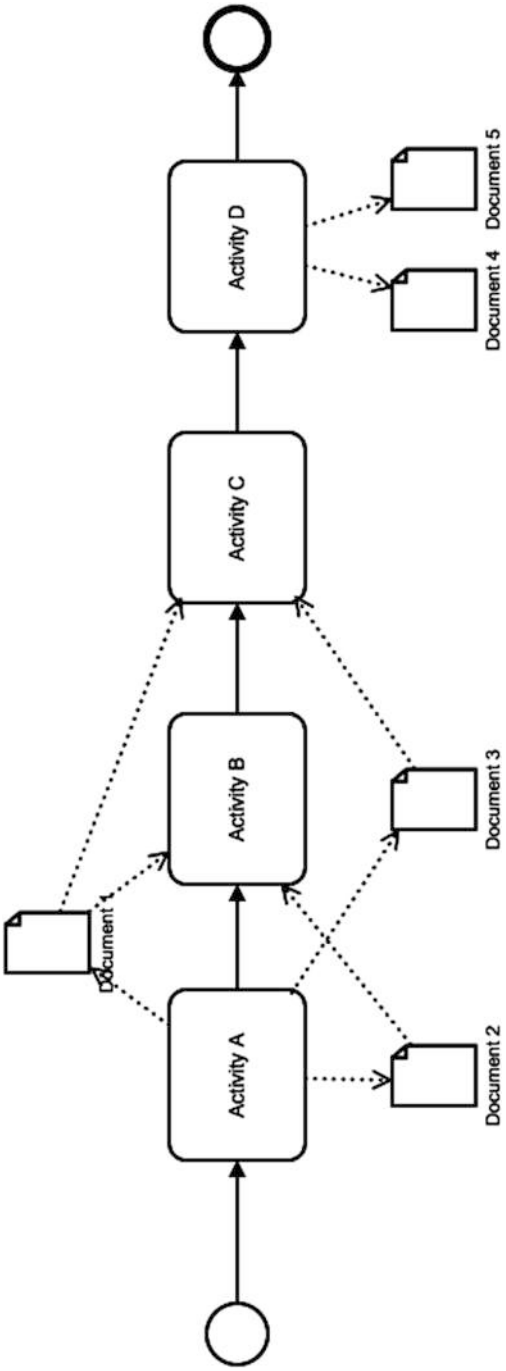

Fig. 9.8 Data object based decomposition

Fig. 9.9 Example of a process that is not decomposed

assessing its complexity, estimating the size, prioritizing it, planning its development, writing its specification, and finally writing the code. From a "breakpoint" based view, we look at where in this process it makes sense to break the process from a business perspective. It does not make much sense to break the process between activities "assess task complexity" and "estimate task size" as these seem to belong to each other. Similarly, "prioritize task" belongs more to "estimate task size" but is not that logically connected to "plan task development" Usually, a task is prioritized and when it is time to develop it, it is planned for development. As such, there seems to be a logical breakpoint in between these two activities. Further, it seems that the first four activities belong more naturally to each other and the three following tasks are more related to each other. The process can, therefore, be decomposed at points where there are logical breakpoints or significant milestones in the overall process have been achieved. These points can also be points of interest in terms of process measurement. A decomposition of the above task could result in modeling the first four activities as one sub-process called "create task" and the following activities in a sub-process called "develop task" (see Fig. 9.10 that also shows other sub-processes).

The above described heuristics are more commonly used when discussing how to model main processes. However, as the models get decomposed and more details are captured, other heuristics can be used. Such heuristics are either specific, i.e. can be applied only when certain conditions apply, or are relevant when the process is at a more detailed level. Some of these heuristics are role-based, repetition-based, and refactoring.

Role-based heuristics base their decomposition decisions on "who" is performing the activities. Such approaches are applied in particular to collaborative process modeling where different organizations or business units contribute with their own fragments or when modeling for outsourcing purposes.

Repetition-based heuristics look at occurrences of a certain fragment of a process, when the frequency of sets of activities can be considered as a parameter. Those sets of activities that are repeated more often (cyclical) are separated from those that are sequential or parallel.

Refactoring heuristics seeks to reduce redundancy stemming from when a process fragment is called upon multiple times in different parts of a process, i.e. shared processes. These shared fragments are then modeled as a sub-process. This is, however, more common at the lower levels of detail and not for the main processes.

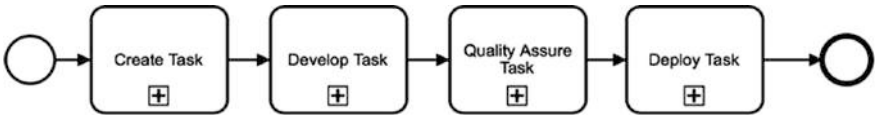

Fig. 9.10 Example of breakpoint-based decomposition

9.3.2 BPMN (Business Process Modeling Notation)

We have already discussed an activity and a sub-process. However, these are not enough when we start modeling processes in more detail. BPMN has an impressive set of notations to accommodate all aspects of process modeling, in particular for creating executable process models (processes that can be executed by an information system). However, when modeling business processes with domain experts, the basic notations are more than adequate. The graphical representation of the basic elements of BPMN are illustrated in Fig. 9.11. Those are:

- Activity (the work that is being performed).
- Events (events that take place that, initiate a process, occur during the process, or end the process).
- Sequence flow (the lines that connect different elements of a process model showing from where to where the flow is going).
- Gateways (the element that tells which paths an instance of a process can take).
- Pools and lanes (the resources that are performing the activities).
- Artifacts (the physical and data objects that are used and/or produced by activities of a process).
- Message flows (the flow information between two parties in a process).

Let us take a closer look at an example. The process model in Fig. 9.12 captures online shopping.

The model shows that a customer can search or browse for an item. Once the item is found, it is viewed, and a decision taken whether to buy or not. If the customer does not want to buy the item, there is an option to add it to the wish list. Once the customer has decided to buy the item, they add it to the shopping cart and can either continue with shopping, updating the cart, or proceed to the checkout. Having entered some data, the customer checks out and the purchase is complete. You will notice that this is a simplified example. The process model does not capture many of the activities that might happen. For instance, a customer might have an account and the login is not covered, neither is the cancellation of an order. Adding every detail takes time and the analyst has to find the right balance between the time required to add additional details and the need for additional details to be captured.

9.3.3 Modeling Business Processes

As mentioned above, a business process is a way an organization creates its value. In a way, all that the organization does is a process of some form. Modeling the current situation, often referred to as the “as-is” model, allows for understanding how the work is conducted. In other words, the as-is model captures how the situation is de facto.

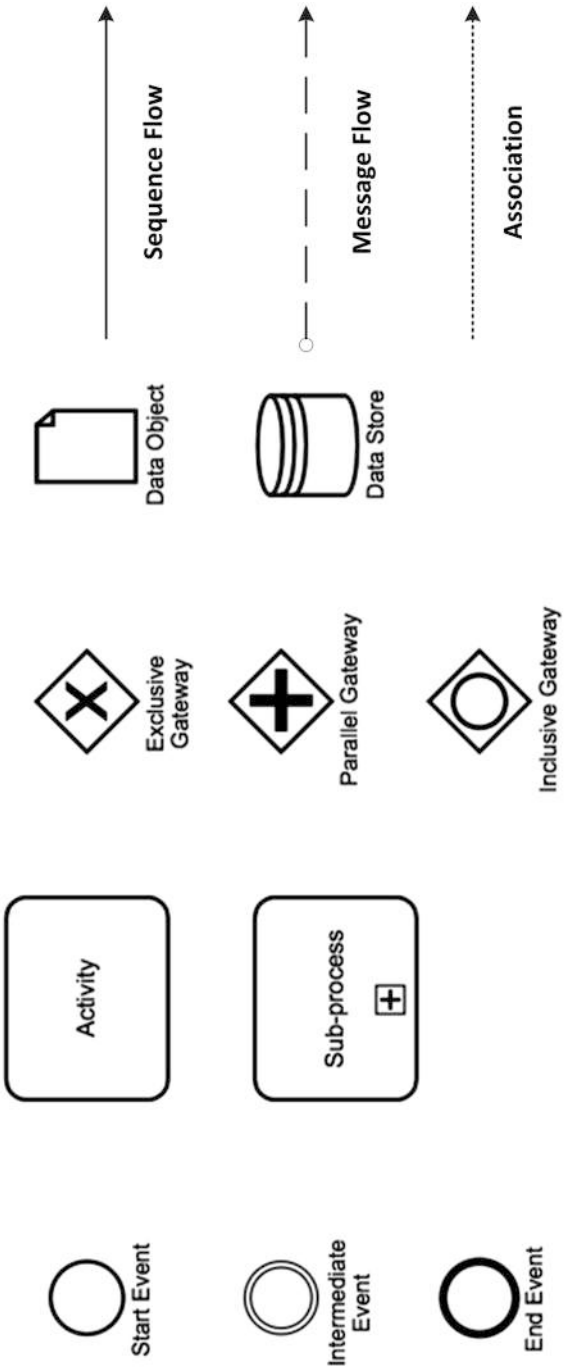

Fig. 9.11 Most commonly used elements of BPMN

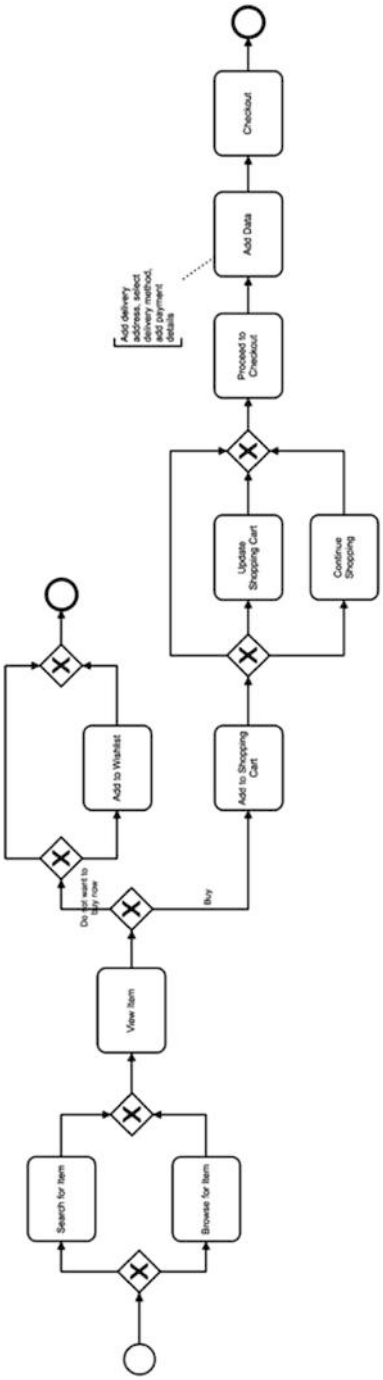

Fig. 9.12 Simplified process model for online shopping

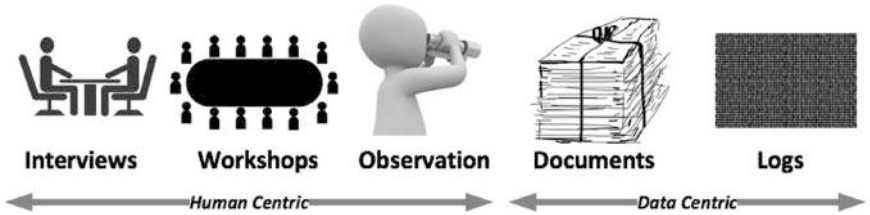

Fig. 9.13 Sources for process model discovery

An analyst will oftentimes engage in modeling processes. At this stage of the business analysis process, the main objective is to model the current as-is situation for the purpose of understanding how the work is being conducted at the organization. Process discovery is encompassed by Business Process Management, which is a subject on its own and far beyond the scope of this book. However, as business processes and their modeling are very common, we have introduced the subject here. There are several ways in which business processes can be discovered and captured as models.

The basis for modeling can either be humans (human-centric) or information from various sources (data centric), as presented in Fig. 9.13. Data-centric approaches look at information captured in other forms where an analyst can model a process by examining documentation such as instructions and other similar documents. Another method is to examine the logs of information systems and by applying "process mining" tools [88], extract process models from the logs. In such approaches, a tool will examine the log and based on a unique ID for each transaction, the activity, and the timestamp, create a model. The benefit of such methods is that the "truth" is modeled as opposed to what various users "think" is happening. Another major benefit is its speed. Process mining tools can create models that capture many different processes in great detail. To achieve the same results with human-centric approaches would require more time than is reasonable to spend. On the other hand, not all information system logs have the structure and data required to apply process mining tools. Finally, one should note that process mining would create models of the information system processes and not necessarily the business processes. This is because the logs only capture the activities that users perform and are recorded in the system. As such, activities that are not recorded in the system remain outside of the log and therefore, the models. An analyst should consider if process mining tools could be applied. There are commercial tools such as Disco from Fluxicon[4] and Celonis[5] as well as free alternatives such as Apromore[6] and ProM.[7] The benefits gained with digital cases can outweigh the limitations.

[4] https://fluxicon.com/disco/.

[5] https://www.celonis.com.

[6] http://apromore.org.

[7] http://www.promtools.org/doku.php.

The most common way business processes are modeled is in workshops facilitated by a modeler. In such cases, the relevant stakeholders gather and, in a collaborative manner, model the business processes. Although this approach can be time consuming, the benefits are worth it. The common understanding that is created by sharing and learning about how a process works is very useful when discussing the issue at hand. Furthermore, no single stakeholder knows in detail how a process works. As such, gathering all those directly involved or affected by a process to model is highly productive in finding all different ways and details that matter.

There are two main approaches to model a business process when using workshops. The first is to start from the main process and work through in more detail or a top-down approach. The other main approach begins with the activities and then builds a hierarchy i.e. a bottom-up approach.

9.3.3.1 Top-Down Approach

A top-down approach begins with the main process at a high level where the main activities (5 ± 2) of a process are identified. In practice, this is achieved by following these steps:

1. Identify what will initiate the main process, i.e. when does the main process start (when a customer order is received).
2. Identify what will conclude the end process, i.e. when does the main process end (when the customer has paid the invoice).
3. Determine what major steps are needed to go from the start of the main process to its conclusion. The main process usually has 5 ± 2 major steps (sub-processes).
4. Organize the sub-processes in the order they are executed from the start of the main process until the end.

Then each one of these main steps of the process is examined and modeled at an increased detailed level by following the same steps, but at the next level.

When analyzing the current situation, it is vital to have a good understanding of the situation. and to know precisely what role parts of a process play in the problem. As such one should be very careful when defining the start and end of a process. There might be a temptation to define the start based on what certain stakeholders state. They have the best view of their part, but not necessarily the whole picture. A good strategy is to start from the very beginning of a process. This is done by asking questions about what triggers the whole process. The start of the process is not necessarily when it comes to a certain department or division. It is rather when the process begins regardless of the business unit. There are no clear rules to apply for defining the start process. It depends on the situation and what kind of problem is being analyzed. However, it is better to cover more than less of a process. Consider for instance the following examples:

- An order to cash process starts with the customer placing an order. However, sometimes it might be more relevant to consider the point that the customer considers a product as starting point. A supermarket might consider the start from the order being placed, while an online store would see the start from when the customer logs on.
- A manufacturing process starts when a firm receives goods from a supplier. However, in certain circumstances it might be more valuable to consider the start of the process as from when the need of goods is identified, and an order is placed.

Determining the end of the process is important and the same reasoning applies. Sometimes, it might be as simple as the product has been delivered to the customer. However, that might not always be the best approach. Consider if the product requires service such as medical equipment or a car. In such cases, the process can end with the customer receiving their product but sometimes it might be advisable to set the end of the process to when the service agreement ends, or the product is decommissioned. This will depend on the industry, the product, and the business model of the company. Including service instances in the process might allow for identifying opportunities to upsell the customers extended warranties.

In the top-down approach to modeling businesses, it is important to define the scope of the process (defining the start and the end of the process) in broad terms, so that the whole process is considered. If some parts are not relevant, one does not model these parts in more detail, but they are still included in the overall view. As a rule, it is better to have a wide process scope rather than too narrow.

The benefits of the top-down approach are mainly that it gives a good overview of the process areas and how they relate to each other and ensures that key areas are captured. As mentioned above, by beginning from the top, it is easier to capture the scope and decide which parts of the process to investigate further. In addition, as the relations between the process areas are better understood, it might be easier to discern which related process areas might be worth investigating further. However, there is a risk of organizational drift, and if one is not careful, the models might implicitly reflect the organizational structure and division of work rather than the genuine process of the organization. Furthermore, as the models begin from a higher level, there is a greater risk of missing valuable details.

9.3.3.2 Bottom-up Approach

The bottom-up approach takes the opposite view on how to model a process. The idea is to start from the atomic activities, what is actually being done by the participants in the meeting and build the process model from there. This can be done in different ways but one of the most common method is by using post-it notes. In practice, it can follow the steps described below or similar steps.

1. All participants are given a bunch of post-it notes and pens. On the notes, they are asked to write the name of the activities, one per note.

2. Later, the facilitator collects all notes.
3. One by one the notes are put on a wall. The facilitator asks the participants if the activity belongs more at the beginning, the middle or the end of the process. Then the note is placed on the wall. The next note is taken and placed in relation to the first note. For each note, the facilitator asks the participants to clarify what the activity is.
4. Having placed all the notes, the gaps (activities missing) are identified. Notes for those activities are then put in place.
5. The sequence of the activities is verified, the notes are gathered and captured as a process model.

The bottom-up approach does not accommodate for defining the start and the end of the processes. It is, therefore, important to have that conversation during the meeting. When the notes are being placed and explained, new activities are identified added to the wall.

The main benefits of bottom-up are the richness in detail and the relative free format without the predefined borders of the process. As the process modeling begins at the bottom and participants name atomic activities, the level of detail is very high. Furthermore, as the process is not "defined" in its start and end as is the case with the top-down approach, the activities will extend over the whole process and not be confined to a specific part of the process. As such, there are no implicit borders. However, as the atomic tasks are being written down by several participants, there will be a high rate of duplicity. This is to be expected and, as participants will use different terms, or word the activities differently, it might be required to interpret the different labels to find a common wording and understanding of the activities. In addition, as the process is being modeled flat, the process models tend to become quite long and that can hamper understandability.

9.3.3.3 Mixture of Top-Down and Bottom-up

These two methods can be combined to bring the benefits of the two approaches while reducing the disadvantages. In an approach that uses both methods, the modeling begins with defining the main process i.e. the process at the highest level. In doing so, the overall framework or boundaries are quite widely defined. Following this step, each major step or sub-process of the main process is modeled bottom-up. Such an approach would create richness in detail while being more broadly defined and therefore, give an advantage. Note that modeling bottom-up does not necessarily require each participant to write an activity on each piece of paper. It can also be done by defining the start event and successively building the model by asking "what happens next?" During such an exercise, several iterations are made meaning that once the model or part of the model is captured things are changed, added, removed and so on. Rarely is the case straightforward, one directional where the process of modeling begins with the start event and then step by step progresses in a straight line to the end event.

Chapter 10
Metrics

Most initiatives taken to improve the business should produce results. An important question in this regard concerns how we can know if the solution solved a problem, or produced an impact and perhaps more importantly, by how much was the situation improved [89, 90]. Before such questions can be answered, it is necessary to know where the starting point is. In other words, before we can assess how much the situation has improved, we need to know what the current state is. In essence, working with metrics is about getting answers to three main questions:

1. How are we doing right now?
2. How do we know this?
3. Where in this process or operation do we want to improve?

Using quantifiable data to answer the above questions is very powerful and complementary to other qualitative methods. Metrics and measures help to quantify the current state. Companies will vary in how well they keep track of their metrics. Some simply do not have many metrics in place. Others might have quite elaborate metrics that are continuously monitored and analyzed. The situation will differ from company to company. In this regard, working with metrics primarily concerns the following:

- Use quantifiable data to analyze the current state.
- Develop metrics where and when needed.
- Work with existing metrics as part of analyzing the current state.

The first two points are very closely related. When a company has already defined metrics, it is because that area of operation is important to follow and assess so data is collected. If the analyst is involved in an initiative that overlaps with such parts, those metrics should be included in the current state analysis. However, at times, there are no metrics, or some aspects are not measured but the data is available. In such cases, it might be valuable to collect data and make a quantifiable assessment of the current state. Such numerical description of the current state can

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be highly valuable when digging deeper into the root causes of a problem. Such data can help in verifying or falsifying ideas and statements given by stakeholders.

In short, if there are sufficient metrics available, the analyst will use them, but if they are incomplete or lacking, the analyst might wish to develop his or her own. In such a case, the question is how to do so.

10.1 Developing a Business Metric

Before we discuss developing a business metric, we should note that there is a difference between developing a metric to understand the current state and developing a metric for the purpose of continuous tracking and monitoring as part of the regular operations of a company. In the first case, we are predominantly concerned with understanding the current state and identifying areas of improvement. However, these two might be connected. If a metric is developed for assessing the current state, it is only natural that the same metric is used to evaluate the impact of the solution. As such, it might also be interesting to keep that metric to monitor progress and further improvement opportunities. The main difference lies in the capability and set up that will allow for effective monitoring of the metric long after the analyst has finished working on the project.

10.1.1 A Metric in Context

The main purpose or objective of any metric is to assess or measure the performance of an aspect of a business. Furthermore, the idea is not just to know where we are, but to use the data to push forward to make improvements. Some metrics are more important or even key metrics. These are called Key Performance Indicators (KPI). Metrics, therefore, exist within the context of the overall strategy of a company. If the metric is not aligned with the overall strategy, it might become redundant.

In the example presented in Fig. 10.1, a company has an overall business strategy to be the leading company in its market. To achieve this objective, they wish to have the most satisfied customers and also the best profitability. The KPI are therefore related to these goals and objectives. They follow an annual customer satisfaction index (conducted by an independent research institute) and aim at being in the first position. Furthermore, they also measure their profitability by aiming for the lowest cost/revenue ratio. These metrics apply to all departments and to achieve this, they have support metrics where the efficiency of the IT costs is measured. As can be seen, metrics are valuable when they exist within the company's overall strategy and help contribute to achieve its goals and objectives. An analyst working with developing a metric should be aware of the overall strategy to understand how the specific project contributes to the overall objectives and goals.

Fig. 10.1 Strategy and metrics

10.1.2 Using Defined Metrics

There are many pre-defined metrics available for almost every industry and process. These are metrics that many companies, both within and across industries, care about and wish to monitor. Customer satisfaction is an area that most companies care about and therefore, there are sets of pre-defined metrics. Other metrics are more industry specific or domain specific. There is extensive research on software metrics, and for the curious analyst a quick search on the Internet will reveal many resources listing different metrics to use.

Using pre-defined metrics can be enough but one should be aware, as mentioned before, a metric is best when considered in its context. As such, a pre-defined metric might not be aligned with the objectives and goals of the company. Each organization has its own strategy, culture, context, processes, capabilities, terminology which make it unique. Therefore, the use of a pre-defined metric might prove inefficient.

10.1.3 Identifying and Developing a Metric

When beginning from scratch to develop a metric, there are three sources that identify areas in need of metrics. These are as follows:

- **Customers**: what customers think or say is important. Customers are the ones who pay for the products and services and taking into account what they consider to be important is valuable. Do they consider price to be most important or do they value quality? Do they feel customization being more important than

experience? Is the product important or the surrounding services? In essence, when developing metrics, it is good to consider what customers find valuable.
- **Problems**: where do we have problems in our operation or processes? In other words, a source of metrics can be where the problems are.
- **Objective**: where and what do we want to advance? At times, a company wants to achieve something that is not particularly a problem, and might want to increase their level of automation, gain a stronger position in the market, or reduce their overall costs. Such objectives can also be a good source of metrics.

The first step is to identify an area where some improvement in performance is required. Let us assume a restaurant has received complaints about the long serving time customers feel they are waiting for the food to arrive. In this case, we are looking into what customers value and what they think is important. Through discussions and surveys, it becomes known that 15 min is an acceptable time for customers to wait for their food. After 15 min, the customer will get impatient and consider leaving the restaurant. Further measurement shows that on average, food is served within 25 minutes. This information is part of quantitative analysis of the current state. We now know "how we are doing" and we have answered "how do we know this."

The next step is to define the performance metric or how do we measure the current state? Clearly, improving the serving time is the performance objective. We therefore want to measure serving time and we know it should be less than 15 minutes. However, we do not wish to work with each serving time but rather aggregate these numbers, so we can get an overview of the performance. Using percentage allows us to do so. Rather than looking at only the serving time we now focus on the percentage of customers who get their food within 15 minutes. Naturally, the higher this percentage is, the better is the performance. Our metric is therefore "percentage of customers served within 15 minutes".

The final step is to define the target. Perhaps having 90–99 percentage of customers served within 15 min is a realistic and desirable result. Another option would be, depending on the context, to separate peak hours from normal hours and have different targets for each. For instance, maybe the restaurant finds it more valuable to serve customers within 10 min during peak hours and 15 min during normal hours. As such, the target might be "percentage of customers served within 10 min during peak hours is above 95%" and "percentage of customers served within 15 min during normal hours is above 90%."

There are no set formulas for developing metrics but there are many suggested business metrics and KPIs. Finding and developing good metrics is a somewhat creative and iterative process where the source of the data, how to collect and gather the data, frequency, cost and difficulty of data collection have to be assessed within the context of the company.

10.2 Key Performance Indicator (KPI)

Some companies use a set of business metrics to track, monitor, and assess the development or progress of various aspects of their businesses. It is important for a business analyst to get acquainted with metrics that capture and describe the relevant aspects of the problem or issue being investigated. Understanding the business metrics and how the current performance is, gives two benefits. First of all, the metrics can be used in the process of defining the problem, eliciting the requirements, and taken as input in the design phase. Secondly, well defined and relevant business metrics are crucial for evaluating the final solution.

Understanding relevant business metrics i.e. metrics that quantitatively describe relevant aspects of the problem area being investigated, constitutes an important part of the current state analysis. The acronym "KPI" is used and stands for Key Performance Indicator and is the same as a business metric but targets a key or critical area of the business where the progress and performance matter more than other areas. To take an example, a company might monitor the number of unique visitors to their website (a business metric). However, their KPI would be the ratio of website visits and activation (for instance buying a product or subscription). The number of unique visitors might increase every month, but it will not matter as much as the KPI that results in increased revenues. In fact, the number of unique visitors might stay the same but if the ratio of visitors and activation improves, it will affect the revenues. As such, it is a more relevant to important business metrics and thus a KPI.

10.3 Good Metrics

A good business metric has the following characteristics as defined in BABOK:

- **Clarity**: A good metric is clearly defined and precise. There should not be room for interpretation as to what the metric measures. A metric should not measure two things at the same time but rather focus on one aspect.
- **Relevance**: A good metric is relevant to the concern i.e. it is aligned with the purpose for which the metric is used. A metric is not a goal in itself but rather a means by which we can track, monitor and assess the progress of a certain business aspect. It, therefore, follows that the metric needs to be relevant and in sync with the reason and purpose of the metric.
- **Economical**: A good metric should be producible at a reasonable cost. If the costs or the time required to make a metric available are high, the metric might be too complex. In such cases, there is probably another metric that is better suited for the purpose.
- **Adequate**: A good metric provides "enough" data for assessing performance. A metric might produce data but not sufficient data for assessing the performance of a business aspect.

- **Quantifiable**: A good metric should be independently validated and not easily subjected to changes.
- **Credible**: A good metric should be trustworthy in the sense that it is rooted in experience and research to ensure that the metric works.

A good metric does not necessarily need to comply with all of the above criteria. Some aspects of the business cannot be measured directly, or it is not possible to measure them in an economical way. Consider customer satisfaction which is not easily and cheaply assessed. Customer surveys might be one way, but such methods can be costly and there is a limit on how frequently they can be conducted. In such cases, it is might better to use approximations such as repeat purchases.

10.4 Examples of Metrics

There are no set rules as to which metrics to use. It will depend largely on the business, the industry, the function, the aspect being measured, and other parameters. Marketing metrics for digital channels might aim at tracking the performance of marketing efforts on social media, to assess the effectiveness of online campaigns, marketing efforts and so on. A company might choose to follow metrics such as web traffic sources, online incremental sales, social sentiments, SEO keyword ranking, and SEO traffic to track, monitor and assess their digital marketing.

Marketing aims at increasing sales and, as such, sales are an important aspect of any business. To measure and assess sales, are metrics such as sales growth, sales per product group, the average value per purchase, or re-visits.

In addition, companies that offer SaaS (Software as a Service) usually have another focus. They need to closely monitor their ability to retain customers. Such companies have subscription-based pricing and to maintain revenues, they need to keep the customers. Furthermore, they want to attract new customers. In such cases, metrics such as customer retention rate, monthly recurring revenue, customer lifetime value and customer churn rate are valuable metrics to track.

If social media is important to a company, they would keep track of metrics used by followers of Twitter and Facebook. They would also monitor the referrals, likes, and conversions from social sites to website and purchases.

The art is to find metrics that clearly and directly measure the intended performance. This is referred to as "validity" and the data used for the metrics needs to be stable and available over a certain time period. If the data set is too small, it does not give enough information. This is referred to as "reliability." Finally, the "timeliness" is a metric that measures on an annual basis and might not give good enough information as the time period is too large. Similarly, some metrics such as sales are better if considered on a monthly or quarterly basis rather than daily.

10.4.1 Business Process Metrics

The above examples concerned general aspects of a business operation worth monitoring. However, when working with a specific initiative or project, one might wish to measure the performance of the current state for the purpose of identifying where one can improve the process. As part of the current state analysis, one or several business processes is often modeled. Such models display the way work is conducted but to understand how well this work is conducted, business process metrics can be used. It is not possible to define what metrics to use because the metric depends on the process. Clearly, the same metric cannot be used for a production process as well as an issue resolution process. However, most metrics fall into one of the following categories:

- **Cost (efficiency) metrics**: Such metrics aim at measuring the costs associated with the processes. Such metrics measure the average cost to produce one unit of the product or an order, and the average cost per product group (if several product groups are being produced). It is also possible to measure the cost per main steps of the process. The common denominator for all cost-based metrics is simply to get a better understanding of how costs occur and are distributed per unit of product or service.
- **Time metrics**: Such metrics aim at measuring the time it takes for the process to pass different stages. One can look at the total cycle time of the whole process or at cycle times per sub-processes (major steps in the main process), the waiting time at different steps (where the process is just waiting), and ratio of instances where the product is produced within the time desired or orders are managed within certain times.
- **Quality metrics**: Such metrics aim at measuring the quality of the process and the units (products, services), the ratio of errors, number of order entry errors, missing data, complaints, returns, and so on. Another aspect of quality metrics can be when the costs or time needed to process a product or service is higher than the average.

Such metrics can be valuable for the analyst as it will show where in the process there is room for improvement. Any solution being implemented needs to deliver value. Knowing, as part of the current state analysis, where improvements can be made assists in designing solutions that deliver value. Furthermore, as stated before, we can only measure the solution by comparing the post-implementation values (metrics) with the same metrics of the current state.

10.4.2 IT Metrics

Some initiatives aim, at least partially, at improving the efficiency of IT solutions in place. A company might find their current IT solutions costly and difficult to

develop and therefore, seek better alternatives. For this purpose, it is possible to use metrics to better understand the cost and performances of IT systems. As stated before, the metric will depend on what aspect one considers. However, most metrics can be categorized as follows:

- **Operational metrics**: Metrics availability measure the ratio of time the application is functioning or its "up-time." Another aspect can be batch times or the ratio of batches that finish on time or the average batch time. Yet another example of an operational metric is a number of production problems such as bugs, issues, deadlocks and so on. These metrics share the commonality of measuring the operation of the application.
- **Project metrics**: Another way to assess an application is by examining how long projects take. If it's a fairly large application with a backlog of items concerning bug-fixes, enhancements, maintenance and so on, measuring the time of project delivery can give a deeper understanding of how complex and/or effective the developers are. Similar to project time, project cost can be used. Another aspect can be "project satisfaction" meaning feedback from the customers in terms of functionality covered. These metrics are usually gathered via surveys and feedback.
- **Financial IT metrics**: Such metrics look at the financial aspects of the IT system. A simple metric can be a comparison between the budgeted expenses with the actual (direct and indirect) costs of the system. However, it might be more interesting to view the development of different costs over time. Such metrics reveal if the system is getting cheaper or more expensive to run. Furthermore, one can look at what the ratio of different costs are to the total cost. If the maintenance stands for 80% of the total cost of the system, it might have fallen into the maintenance trap where more money is spent on maintaining the system rather than development. Such a trap will cost the business while offering very limited added value.

There are different metrics that can be used but as part of the current analysis, it might be relevant to understand the performance of the IT systems involved. The initial solution desired by the stakeholders might perhaps not reduce IT costs and it would be more profitable to move to cheaper technologies.

10.5 Benchmarking

The metrics discussed above give an understanding of how the current state is and how it has changed over a certain period of time. However, it does not tell us whether it is good or bad compared to other competitors. A company might have made good progress in regard to certain metrics but be behind in the industry. In order to get an understanding of how a company is performing as compared to others, benchmarking can be used [91]. One of the main purposes of benchmarking

is to identify performance improvement targets. For an analyst working with current state analysis, it is valuable to know how well the area being considered is performing compared to other competitors. This does not mean that the analyst should set up a benchmarking analysis but perhaps the company has conducted such a study before and has data available. It is also possible, depending on domain and industry, that there are publicly available reports and studies that show the performance of different companies within an industry. Although this does not constitute real benchmarking, it might prove to be a valuable input.

There is no standard process for benchmarking. Several authors have proposed different alternatives but most share common steps. These are as follows:

1. They begin with selecting and/or defining the process or aspect that is to be compared.
2. Following this, one needs to identify the best performers, leaders or relevant companies to compare with.
3. The next step is to gather the information which is done by surveys, collaborations via consultants, and visiting the web for available materials.
4. Once the data is gathered, the analysis is conducted where the gaps are measured and proposals for improvements are made.

The different types of benchmark analysis are financial, strategic, functional operational and process. All aim to compare oneself with the best so as to gain an insight into how one can develop. If the benchmark is based on metrics, it is important to have a clear definition of the metric so as to ensure that apples are being compared with apples. As part of the current state analysis, benchmarking gives a view of where the current state stands in relation to the best performers. We will return to this topic when we discuss future state analysis.

It is worth noting that benchmarking does not have to be confined to the best performer in the same industry. While such benchmarking has its value, it might sometimes be more valuable to extend one's scope to other industries or cases that have a point of commonality. A gas station wants to improve its structure and set up. One way is to look at the best performing gas stations and look at their operation including the time it takes to fill the tank, the ratio of customers who go into the gas station store to buy things, use the car wash and revenue per customer. Another way is to re-think more creatively and look at the pit-stop of a Formula 1 race. There is not much in common but the fact that pit-stops are designed to be extremely fast, there might be some principles that could be used to improve the speed by which customers fill their tanks. The same gas station might want to look at hotels and how they receive customers in the lobby and reception area. Again, the similarities are few but perhaps some aspects of the design, placement, and other aspects might help the gas station in improving their customer experience and increase the revenue per customer.

Patterson [92] introduces and discusses six different categories of benchmarking. In his categorization, we find the following:

- **Internal Benchmarking**: Where one identifies and compares processes with comparable processes within the same organization. The benefits are that it is cheaper, faster, information is more readily accessible, and has a low risk.
- **Competitive Benchmarking**: Where several competitors come together and share data for mutual benefit. Naturally there are risks such as trade secrets being exposed and some companies giving misleading information. However, such benchmarking could be made by several competitors collectively to hire one independent consultancy firm, together define the parameters, and provide the data to the consultancy firm. The final report produced will include comparison where the data is aggregated, showing the rankings of the companies in regard to different parameters but not revealing the company names. As such, a company will know their own ranking but not the ranking of the competitors.
- **Collaborative Benchmarking**: Which is similar to the previous one but differs in that companies within the same industry share primarily quantitative data via industry associations that generate reports.
- **Shadow Benchmarking**: Which relies on publicly available data about competitors. Although the data is sometimes incomplete, such methods can provide valuable input.
- **Functional Benchmarking**: Where processes are compared with similar or identical processes from outside the industry. A service company might compare its procurement process with that of a manufacturing company.
- **World Class Benchmarking**: Where processes are compared across industries. A company operating in manufacturing electronics might compare its billing processes with that of a credit card company.

Chapter 11
Data and Information Systems

The business processes of an organization are supported by information systems, oftentimes connected to each other. In larger organizations, the interconnectedness of information systems can be quite complex. As part of the analysis of the current situation, it is valuable to have an overview of the data structure and the IT systems that support the business being investigated. Different models play an invaluable role to understand the IT system perspective. The actual notation used to model is not as important as getting the information. The main purpose of such models is to illustrate the information systems being used in the organization and how they interact with each other. Furthermore, several viewpoints can be integrated into one model. One model might capture the connections between IT systems and another represents the data flows.

While there are different ways of representing the systems that enable process executions, the main focus of the current state is to get a good overview and not detailed models. Model types such as sequencing diagram and state machine models are oftentimes used when details matter more such as in the design or delivery phases. At this point, models that capture higher levels of abstraction are in focus. We begin with capturing the data being used and produced by the various IT systems and then move to modeling the IT structures. The approach is to begin at a high level, encapsulating an overview of many IT systems and move downwards to models for specific IT systems. We will also briefly discuss the role of Business Architecture and Enterprise Architecture.

11.1 Data Perspective

Any given organization uses data and information in their daily operations. Information systems enabling the operations and processes of a company, work with creating, reading, updating, and deleting data. The data and information are sent to other systems, populate reports, and are used in a myriad of ways to support

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decisions and enable the processes of a company. Capturing data and information, understanding them and their relationship, and how to represent these aspects in models is part of understanding the current state. There are many different models that can be used to model data and information, each with its own specific aspect. In this context, we will discuss what the data means (data dictionary) and how data are related to each other (data modeling).

11.1.1 Data Dictionary

A data dictionary is essentially a dictionary of the data used where the definitions are captured, avoiding multiple understanding or the same object being described with different names. Furthermore, a data dictionary also clarifies the elements of a data and how they can be combined. In other words, a data dictionary serves the purpose of standardizing both usage and the meaning of data elements. There are standardized tools that can be used but it is possible to use spreadsheets to manually populate and maintain the data dictionary.

When working with data, we are working with databases. As such, a data dictionary is a fairly comprehensive description of each field in a database, capturing information about the characteristics of each one of the elements in the database.

The structure and what is captured about each data will vary depending on the case. The most common aspects captured in a data dictionary are as follows:

- **Name**: The unique name used for the data element.
- **Data type**: Description of what data type is used such as text, numbers, date/time, Boolean.
- **Values**: A list of acceptable values for the element, a list of values to choose from, the format of the data clarifying the number of characters and so on.
- **Description**: A textual description explaining what the data element is.
- **Example**: An example of a possible or actual entry of the data.

Let us take a look at a few examples. Table 11.1 shows a simple data dictionary for students enrolled at a University.

Table 11.1 Example of simple data dictionary

Name	Length	Values	Data format	Example	Description
Student ID	6	Text	T99999	A50843	Unique id given
First name	15	Text	–	John	Student name
Family name	25	Text	–	Doe	Student surname
Personal ID	10	Text	999999999	4930601888	Personal code
Gender	1	Boolean	F/M	M	Student gender

From Table 11.1, we see that the student ID has a length of six characters, is defined as a letter followed by a series of numbers and is of text type. We can also see that the gender is given by choosing F or M. An analyst might add additional fields, such as one called "aliases" to capture alternate names of the same data used by different stakeholders. Another field that might be relevant is how the data is managed and if the information is automatically created, imported or manually entered. The student ID might be automatically generated when a new student is registered but the name is manually entered. Perhaps the student data is imported from an external system (central registry) using their personal code. Another field that might be useful is if the data is mandatory or optional to enter. In larger organizations, there might be a form of data dictionary available and a standard template that is used. It is worth investigating this prior to creating a data dictionary to ensure re-use and save time.

Let us consider the example of a small e-commerce business. In this example, the data dictionary (and corresponding database) is quite small. The tables or categories of data that would be relevant for the small e-commerce might be as follows:

1. **Accounts**: customers have to create an account using their emails or perhaps a self-created login and a password.
2. **Customer**: the "owner" of the account and all the data related to that identity.
3. **Customer Address**: the customer must provide several addresses such as home address, billing address and perhaps different shipping addresses (if they want delivery to their office or another location).
4. **Orders**: the orders that are made by the customer.
5. **Products**: the products that this small e-commerce business offers on its site.

Let us create a table for the customer (see Table 11.2). We need to have a unique name or ID to distinguish the customers. It is possible that several different customers have the same name. We can see that the length of the customer ID is five numbers and that it is integer numbers. In this case, it is probably an automatically generated customer ID that begins with 00001 and for each additional customer, adds one number. This could be described in a separate column. We can also see the name of the customer and that the first and family names are separated into two different fields.

Table 11.2 Customer of an e-commerce data dictionary

Name	Length	Type	Example	Description
CustomerID	5	Integer	00001	Unique ID given to customers cannot be null
First name	15	Text	Jane	Customer full name
Family name	25	Text	Doe	Customer full surname

Designing the data dictionary is closely related to the design of the data model or the database. However, it is not always in the best interest of the analyst to start with creating a comprehensive data dictionary. It might be sufficient to get an overview of the main data elements by creating a more general data dictionary. If the analyst finds that many different terms are being used for the same data elements, it is necessary to standardize and have everybody refer to the same data element by the same name. It is common for companies that have merged with or acquired another company to have similar processes and therefore, use different terms and names for essentially the same data elements. One system might use "family name" whereas the other uses "surname." In such cases, standardizing the names by means of a data dictionary is helpful and fields such as "alias" or "description" are more important than "length."

The analyst could start with a "high-level" data dictionary (include the most important data elements and not focus on the details) and as the project progresses and comes closer to a detailed specification, the data dictionary can be enhanced to include more details. The analyst might keep the data dictionary at the level of "customer data" and clarify in the description that it includes name, gender, different types of addresses and so on rather than defining them all. In the early stages of a project, the data dictionary is either not needed or it will suffice to have it at a high-level. If the data dictionary already exists, it is a valuable input and should be consulted. Generally, it will not be used heavily in the early stages.

11.1.2 Data Modeling

A data model describes the data structure of a domain [93]. The described structure includes the data objects and their associations to each other. A data model is, therefore, independent of the technical (hardware and software) solution used. It visually captures the data objects that are important for the business, their attributes and the associations they have with other data objects. A data model is also more "stable" as compared to a process model. Business processes can and should be changed whenever needed and are, therefore, more dynamic. However, data objects are commonly the same regardless of how the process changes. It is possible for new objects to be created and old ones deleted but in comparison to processes, data objects and structures are more stable. A process for registering customers might change but the customer data objects are most likely the same.

There are different types of data models such as conceptual, logical, and physical. Conceptual data models are, as mentioned before, independent of the technical solution and aim at capturing and representing the relationship between the data. Logical data models describe the data in more detail but stop short of how they can be implemented as an actual database. A logical data model would typically include all the data objects, their relationship and all attributes of each object (see Table 11.3). A physical data model goes one step further and depicts the actual design of a database implementation.

Table 11.3 Comparison between conceptual and logical data models

Captures	Conceptual	Logical
Entity name	Y	Y
Entity relationship	Y	Y
Attributes	N	Y
Primary key	N	Y

As can be seen, the different data models are designed for different purposes and will depict the same domain in very different ways. As a project advances, and more IT specialized resources get involved, logical and physical data models become increasingly relevant. However, at the level of current state analysis, conceptual data models will suffice, but it is worth a moment to list some of the attributes of each entity.

11.1.3 Entity Relationship Diagram

Entity Relationship Diagram (ERD) is a conceptual view of the organization from the perspective of "entities" and "relationships." The diagram simply uses some components to visually represent these entities and their relationships with each other. Entities are recognizable concepts about which the organization keeps data. Entities can be representing something physical (employees, warehouse), something organizational (departments, markets, projects), something intangible (product line), or an event (orders, appointments). An entity has instances. For example, the entity "employees" will have multiple instances, namely, every employee is assigned a unique ID to separate that person from the others. However, although there are instances of each entity, the ERD will only concern itself with all the occurrences with that entity. An entity is typically captured as a rectangle.

Entities can be described with "attributes" and as such, anything that can either identify or describe something of an entity is an attribute. Attribute values could present a single fact. The attributes of the entity "customer" should describe only one single fact such as first name, middle name, and family name. These should not be aggregated into one attribute containing the full name. In a similar manner, the address should be divided into its parts such as street address, city, postal code, and so on. The first name or the city name by itself does not explain much but together with the other attributes, it will make sense. In such cases, these attributes will together make the "address" which includes street address, postal code, and city. The "address" is, therefore, a "composite attribute" (see Fig. 11.1). An attribute is typically captured as text within the "entity" (rectangle).

The entities are connected to each other with relationships. The relationships are denoted with a line and can be mandatory or optional and furthermore, have different numerical attributes (called cardinality). A student (entity) can be enrolled in many courses (entity). The relationship is many-to-many as one student can take

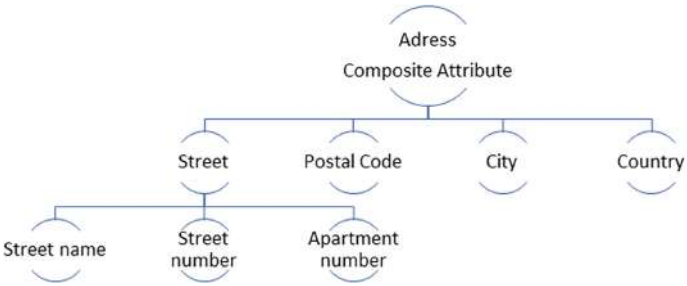

Fig. 11.1 Example of composite attribute

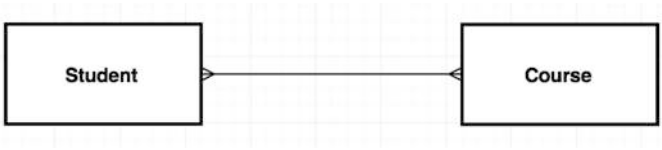

Fig. 11.2 Example of ERD between student and course

several courses and one course has more than one student. This simple entity relationship diagram is depicted in the Fig. 11.2.

The line connecting to the entity (the rectangle) will have a different look depending on its cardinality. The symbol connecting to the entity (rectangle) denotes the cardinality of that entity. A simple vertical line indicates 1. A fork with three lines indicates many (also called crow's feet). A vertical line indicates a mandatory relationship and an empty circle indicates an optional relationship. Figure 11.3 shows how the different cardinalities are represented.

In the example of student and courses in Fig. 11.2, we see that there is a "many to many" relationship. It does not denote if the relationship is mandatory or optional. If there is a need to clarify the relationship in more detail, the vertical line or the empty circle can be used. Figure 11.4 depicts the different types of relationships between entities.

The way the relationship is read is by looking at the line to the entity it connects. Let us take the example of an artist who performs a song (see Fig. 11.5). An artist performs one or many songs. The artist does not have to perform the songs, so it is optional. However, a song must have an artist performing it. In ERD, this is read as the artist performs many songs, i.e., the relationship of the entity called "artist" to the "song" is defined by the crow's feet with an empty circle connecting it with the entity song. On the other hand, the entity song has to be performed by an artist and the relationship between song and artist is defined by the two vertical lines in connection to the entity artist.

Let us examine a simple entity relationship diagram of an online shop (see Fig. 11.6). We have an entity called "customer." The customer places an "order."

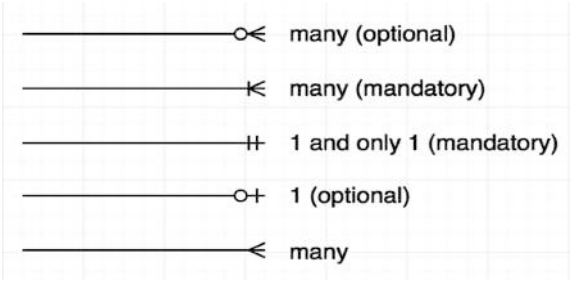

Fig. 11.3 Cardinality of ERD relationships

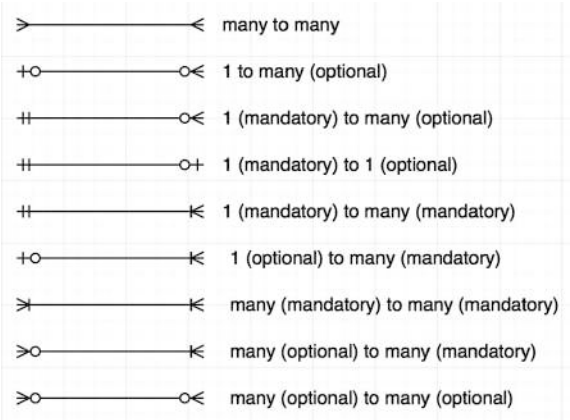

Fig. 11.4 Further ERD relationship notations

We have to have a customer (mandatory) that places an order, but the customer can choose to place an order, so it is optional. The order is, therefore, optional and "many" relationship, as a customer might have several orders. Typically, an order contains one or more "order line items." However, it is not possible to have an order that is completely empty, so it is mandatory for an order to have an order line item. The order might have one or many order line items and, as such, the relationship is a mandatory "one to many." An order line item in itself does not hold anything. It references the product that the customer wants to buy. Therefore, the order line item must reference one and only one product. However, the product might be included in one or many order line items.

Data modeling requires practice, but an analyst should be able to produce conceptual data models. It is important to adapt the level of detail to the purpose. Early on in a current state analysis, it is more important to capture the important entities and their relationships rather than a detailed version. Furthermore, there are many models available on the Internet, and some sources have created generic models for different contexts. Searching for such models might prove helpful. Finally, it is important to remember that there are many different versions of notations for ERDs. They may differ in how they represent the cardinality of the relationships but in essence, they capture the same aspects. As such, there are

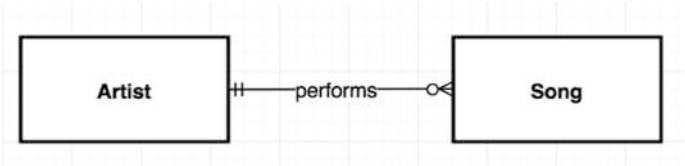

Fig. 11.5 Reading entity relationship diagrams

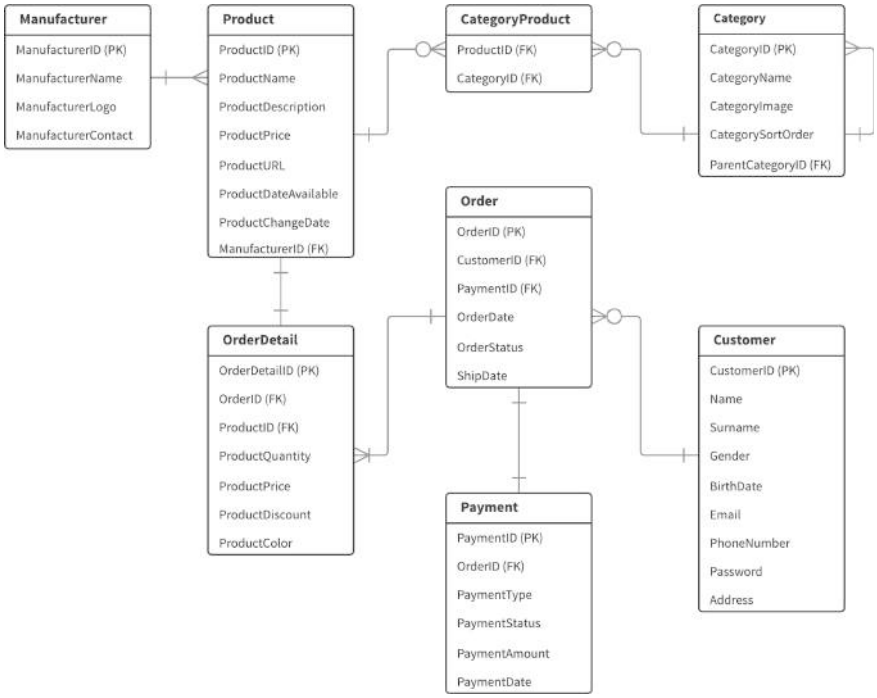

Fig. 11.6 ERD for an online shop

different valid ways of modeling ERDs but as long as the information needed for the purpose at hand is acquired, it will suffice.

In drawing an ERD, it is important to first define the purpose and the scope of the domain being modeled. After this step, the entities involved are identified and labeled as nouns. The next step is to determine how they relate to each other. This is captured with lines between the entities. Then, if it is suitable, the attributes can be added. Finally, the relationships between the entities can be defined by expressing its cardinality.

11.1.4 Data Flow Diagram

A business process captures how work is done to produce value. Process models focus on activities performed to produce outcomes [94, 95]. However, the flow of data, where data comes from, to show which activities work with what data, and what happens with the output results are not captured. Data flow diagrams capture precisely this perspective. In essence, data flow diagrams capture the movement, transformation, and the storage of data within a specific context. The data flow diagram shows the flow of data within an information system but differs from a process model in an essential way. A process shows the sequence of order and therefore, the cause and effect but a data diagram flow focuses on the data and not the sequence of the data movement, transformation, and storage. Although data flow diagrams were originally intended for system analysis, they have additional benefits. They can be useful when capturing the scope and boundaries of a system as part of the current state analysis. When an initiative is heavily focused on a system, such diagrams can be a useful complementary tool to scope modeling, are easy to understand, and can be used for structuring up and decomposing estimation of costs.

Data flows can quickly become complex. Larger information systems will have much data, activities, and actors, so the data flow diagram can be modeled at different levels of abstraction. The highest level is often referred to as the context diagram illustrating the whole system with the main sources and consumers of data. In other words, a context diagram gives one high level illustration of the data relationships between the system being modeled and its main external entities (such as other systems and organizational groups). For each additional level, more detailed information is captured. It is commonly accepted that few systems go beyond three levels. It is preferable, at least in the case of current state analysis, to keep the models on higher levels. Detailed levels will clutter the diagrams and will limit their understanding. The analyst will have to determine how many levels are required, always being aware that the comprehension and usability of the models is the priority. The level of detail will depend on the purpose of the data flow diagram and the type of problem being tackled.

A data flow diagram can be modeled using a top-down approach or a bottom-up approach. In a top-down approach, the initial step is to create the context diagram. As the context diagram is fairly simple, it is created from the beginning. Once the context diagram is in place, the next steps are simply to take a closer look at each of the interactions between the system and its external entities. Such an approach is preferable if the system is fairly simple (not too many external entities) and the analyst involved is familiar with the system. In a bottom-up approach where the starting point is a few data processes or known data flows, might be better suited. Then, these are expanded by looking into the movement of the data and by so doing the data flow diagram gradually grows. Once the diagram has grown enough, data processes, data flows, and data stores can be clustered and modeled at a higher level. When details matter, this is perhaps a better approach. As one begins at the

lowest level of detail, it is easier to see that a data flow is missing, or a data process is lacking but with the top-down approach, it is difficult to "see" what exists.

Gane-Sarson and Yourdon are the two notations for data flow diagrams. Although they differ in notation, they both capture the data flow. Here we will introduce the Yourdon notation. A data process i.e. a function by which incoming data is transformed into an outgoing data is depicted as a circle. The data process is named by using a verb followed by a noun such as "generate report." The actual data flows between the data processes are captured with arrows. The flows show the "data in motion." They are either "input data" or "output data." These are named using nouns such as "inventory list" or "purchase order." Data is stored in a system and these "data stores" are represented with two lines with the name of the data store written in between the lines. Data stores hold data that is repeatedly read and where data is stored for future use. Data stores are commonly named as the plural form of the data being moved such as "inventory" or "purchase orders." Finally, there are "external entities" and they are characterized by being outside the system but have a connection to the system by either producing or receiving data. External identities can be a customer, an organization, a supplier, or an automated system such as an external database. External entities are represented as a rectangle. Let us take a look at the highest level (context diagram) and a data flow diagram of the next level for an online shop.

As can be seen from context diagram in Fig. 11.7, the simplified system for an online shop has four different external entities. The main data flowing to and from the customer concerns orders, whereas the data from the web administrator concerns primarily the content of the online shop. Similarly, we see the credit card details being the main data flowing to and from the credit card company and the shipping information to the courier.

Fig. 11.7 Example of context diagram

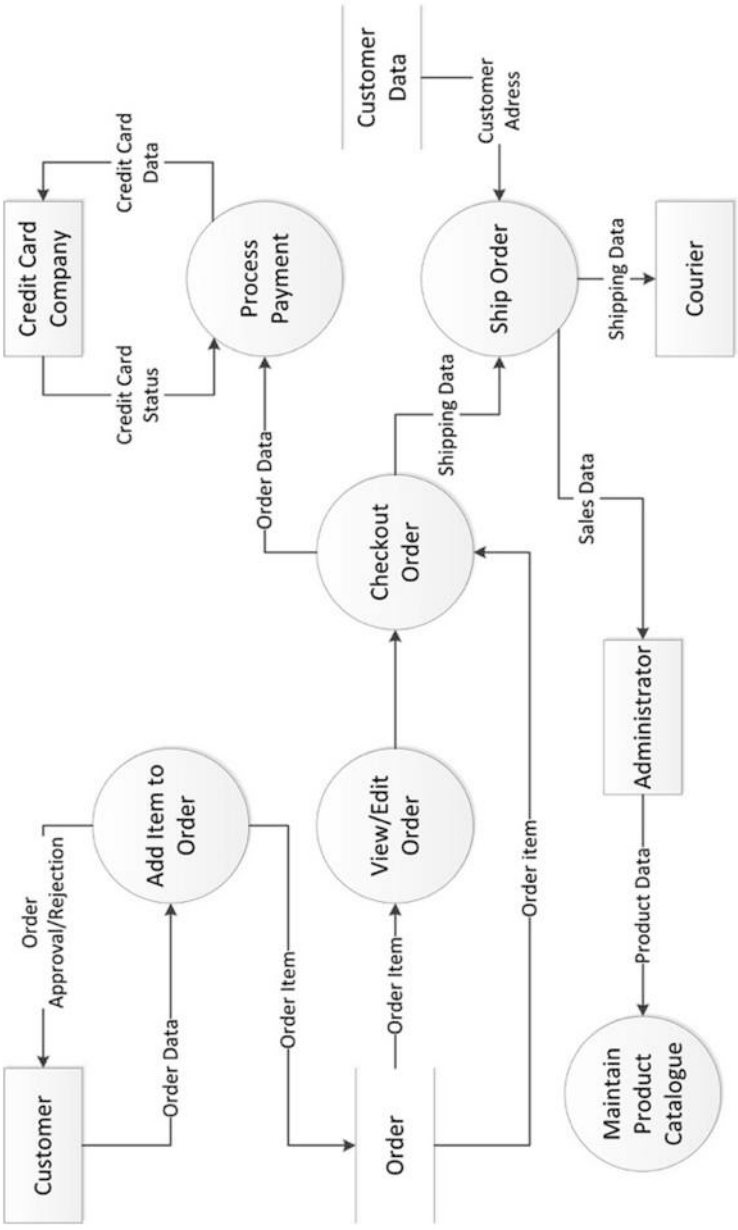

Fig. 11.8 Simplified example of data flow diagram for an online shop

At the next level of detail, a data flow diagram captures the data flows in more detail.

As the diagram in Fig. 11.8 shows, the flow of data is captured, and we see that the process of adding an item to an order, view/edit order, and checkout of the order all have order data as input and output from the same data store. We can also see what data processes are used for example, sales data.

Two observations are worth noting. Firstly, the data flow diagram does not show, particularly as they get more complex, the sequence of activities, only the flow of data. It is not possible to discern "when" a certain data is used as input but only that it is used as an input in certain places. Secondly, we see that the circles correspond with processes (either as sub-processes or activities depending on the level of detail of the data flow diagram) and how data flow diagrams can be complementary to process models. It is up to the analyst to decide when and to what level of detail a data flow diagram is needed. A balanced trade-off must be made between time spent on modeling such diagrams and the value they will have for the analysis work.

11.2 IT Maps

Software systems are connected to other software systems and exchange data. These systems also have an internal structure and architecture. When mapping the current state from a software system perspective, it is useful to consider these different aspects. The software systems and their internal structures matter when trying to implement new solutions and understanding their inner structures and their connections is important [96].

Let us begin with the highest level of IT map which is geared more to business rather than IT. Such an overview of IT systems can be modeled based on business units, function areas and product groups they support.

An IT map, as illustrated in Fig. 11.9, depicts which IT systems are used by different units and for which products/services. It is necessary to understand "where" the system supports "what" products in the organization and this can be helpful when discussing the scope of an initiative and which products/services to include. Furthermore, when an initiative concerns one or two IT systems, such a map helps to determine those stakeholders affected. The analyst might also use this map to discern if there are additional aspects that could be included in an initiative. If a project is focused on improving the processes of a certain unit by improving the IT system, it might be a consideration to include processes of another unit that uses some part of the same IT system. As such, an IT map captures the IT structure at a high level, and its main uses are either in supporting in scope definition and stakeholder identification discussions or in strategic discussions related to IT structures.

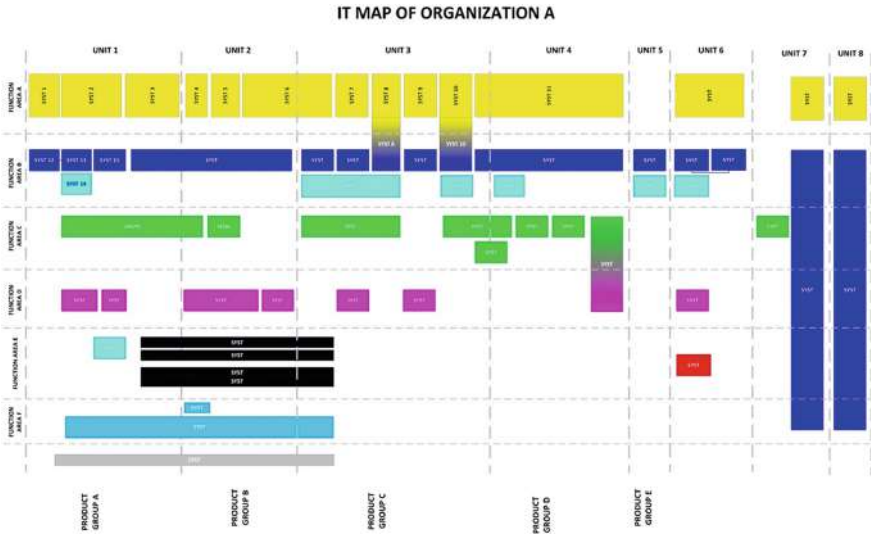

Fig. 11.9 IT Map of an organization

11.2.1 System Interface Map

The IT Map does not provide a better understanding of how systems interact with each other. The interfaces between the systems are not captured and therefore, the "complexity" and interconnectedness of the systems are not captured. For that purpose, the model in Fig. 11.10 might be better depicted as, "who" interfaces between the systems.

An overview of the IT systems and their connections to each other as shown in Fig. 11.10 can be enriched with more data. Generally, it is good to keep the models simple but having many simple models increases complexity. There is a trade-off between simplicity and quantity. However, whenever possible it is better to add another "viewpoint" to the same model so long as it does not make them unnecessarily complicated. One such case is to enrich the System Interface Map with the technical platform. This can be done by simply adding, as part of the rectangular box representing the system, the technical platform of the system such as "UNIX" or "z/OS." The model will remain clear, simple, and serve its purpose to give an overview but also provide information about the technical platform.

In producing interface maps, it is sometimes necessary to conduct an interface analysis. In such analysis, interfaces are identified, data being shared elicited, and requirements for ensuring good interaction between the systems. One should bear in mind that an interface does not have to be only between IT systems. Human beings interacting with a system is a form of interface. Likewise, interface between systems and hardware is also another type of interface. As information is being sent and retrieved from different systems, an interface analysis can be very helpful in

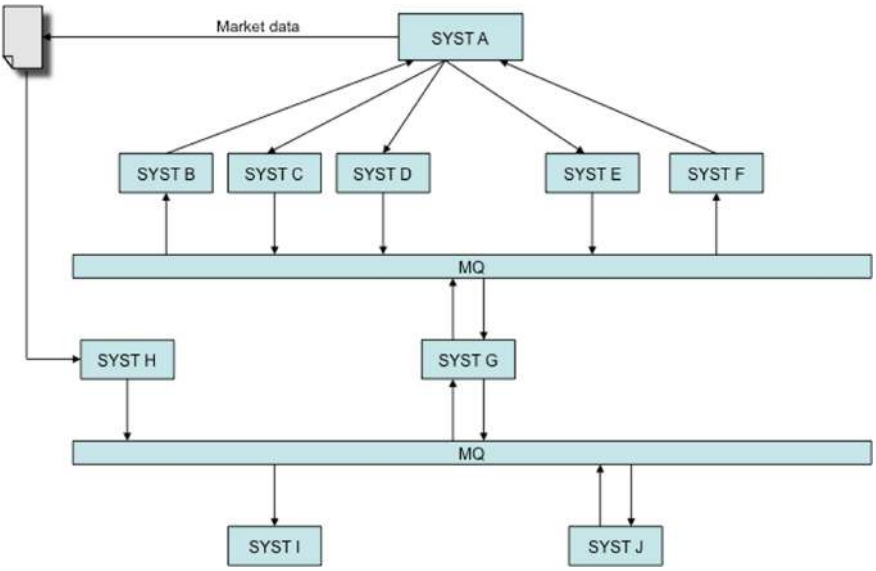

Fig. 11.10 Example of system interface map

eliciting which systems to consider for a change initiative. Commonly, such analysis can be performed reviewing existing documentation, visualizing the interfaces, capturing information about purpose, type, high-level information about data being sent and received, and other information that might be of interest.

11.2.2 Interface Map for One System

Initiatives will affect some systems much more than others and as part of the analysis of the current state, these systems should also be examined closer. Therefore, the main system(s) should be mapped to understand their purpose, and their interfaces to other systems or data sources. It is important to understand the interfaces as they are affected by changes in the system. Describing the current state of key IT systems there is a need to capture interfaces with other systems and what kind of data it exchanges with the connected system. An example of such an "interface map" for a system is illustrated in Fig. 11.11. Note that in this example, the interfacing systems are categorized by function.

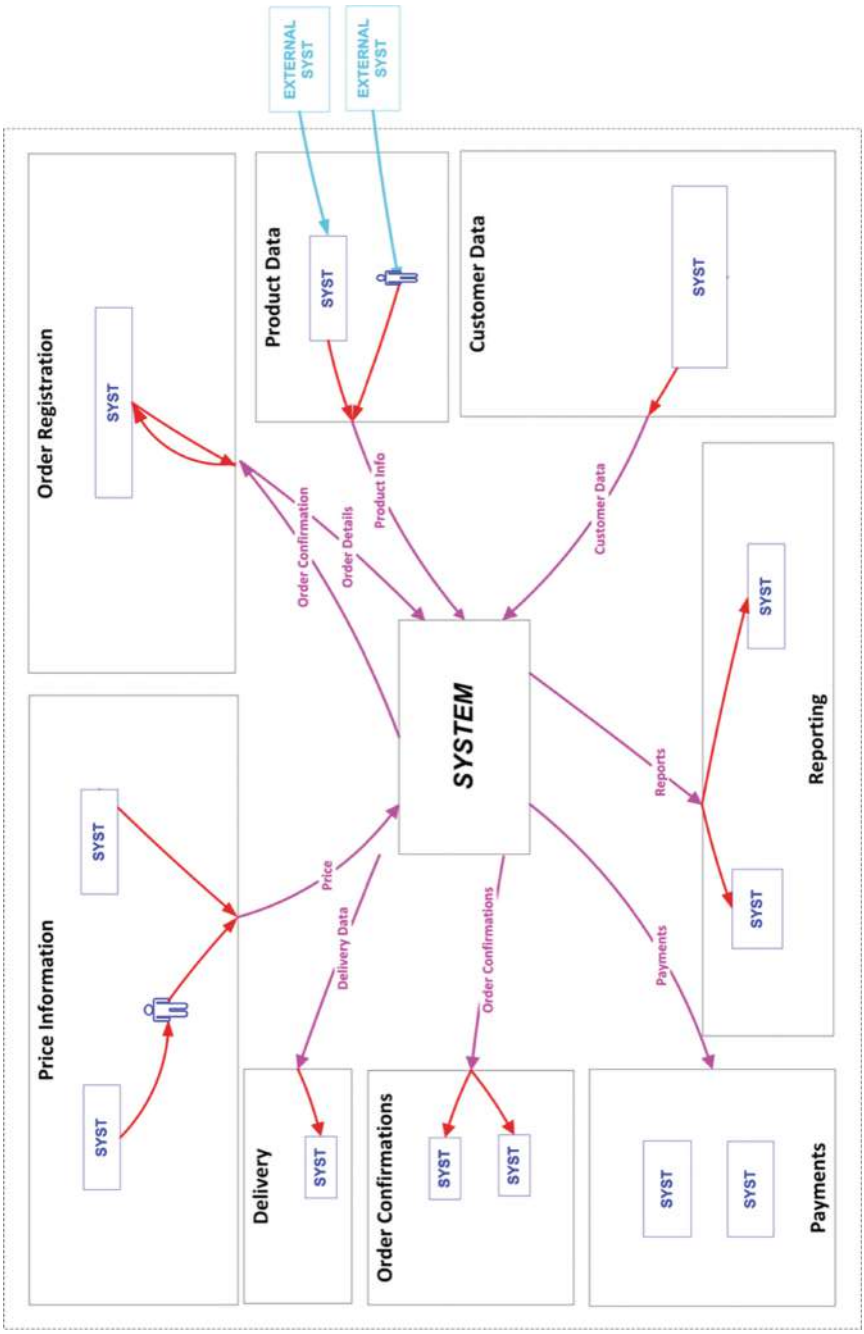

Fig. 11.11 Example of an interface map for one system

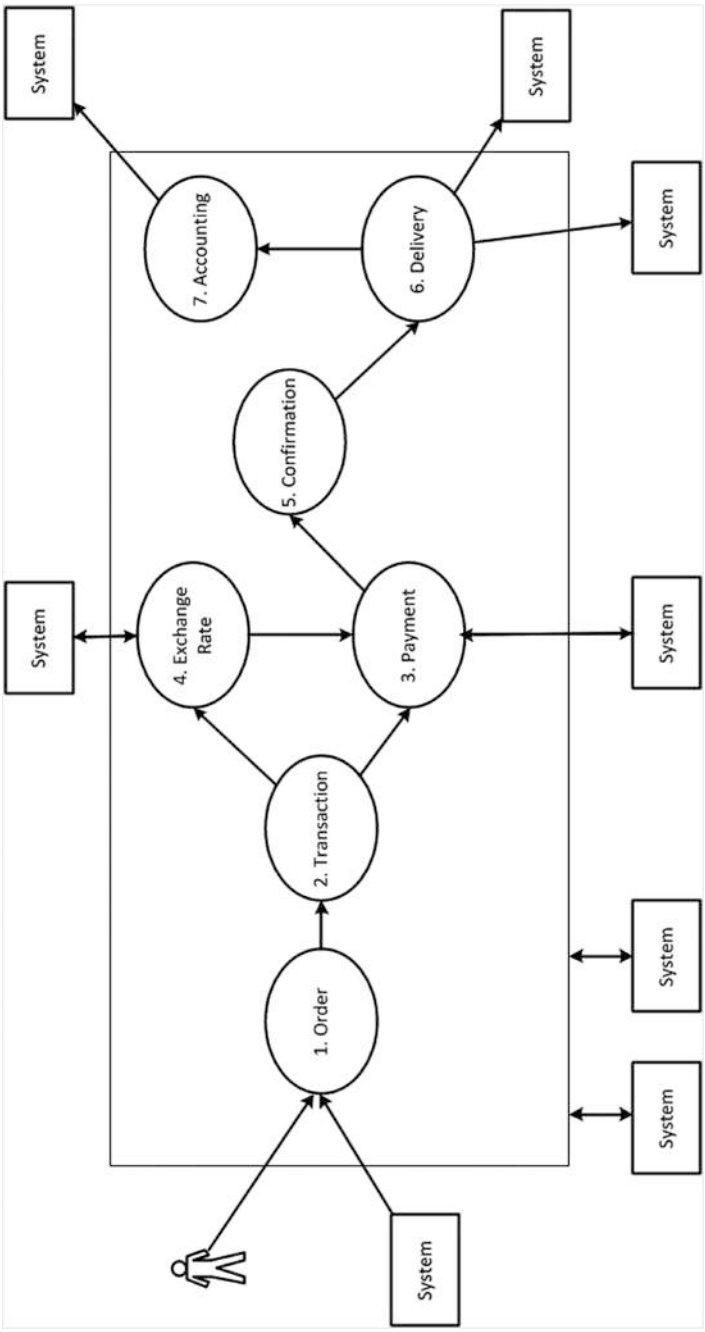

Fig. 11.12 Function map of a system

11.2.3 IT System Function/Interface Map

So far, our models have depicted the "outside" of the IT systems. We need to take a closer look at the "inside" of the systems as well. Figure 11.11 depicts how a system is connected with other systems but does not provide any information about the functionalities within the system and what interfaces are required for what functionality. To capture the "inner" aspects (functions) of an information system, Fig. 11.12 addresses this issue by mapping and illustrating the core functionalities of a system and the interfaces required for each functionality. As can be seen, such a model is derived from use case diagram with a more relaxed interpretation of UML notation.

11.3 Modeling Digital Aspects

Most modeling notations and frameworks were born during the pre-digital era. These models often catered to business contexts that provided physical goods or services delivered via human interaction. Despite their origin, many of these modeling notations and frameworks can be applied in a digital era as well. Although digital technologies have introduced innovation, basic structures are still existing. A furniture company with an online store, will still have a supply chain, storage, logistics, and other traditional elements in place. These elements can and are commonly modelled using time-tested modeling notations. The time-tested models can also be used to model digital use cases. For instance, a context diagram depicts the data being exchanged between a system and its interfaces with external entities. Both traditional and "digital" system solutions have exchange of data with external entities. Pinterest, to take one example, is a social network where users collect and share images found from other places on the web. As can be seen from the context diagram of Pinterest (see Fig. 11.13), it is not radically different from the one for online meal ordering system previously discussed. The system or platform is placed in the center and the relationships with external entities are captured. The main parties are the users, images, boards, and websites. A user can sign up and use the platform. When using the platform, they can search, add, and pin pictures, and create image boards. There is also support for marking a "like". From the platforms perspective, user data is managed and processed for preference analysis. Third party websites are also included in the context diagram as images from their sites are pinned. Pinterest links to the websites and in return, the image data is transferred from the website. Furthermore, once the linking is successfully completed, the image can be found by other Pinterest users. Finally, there is a board that is essentially a collection of images. When a board is created, the main action is to add images to the board. As can be seen, digital aspects can be mapped by traditional modeling notations. The basic logic is still relevant, even if the terminology and tools have changed.

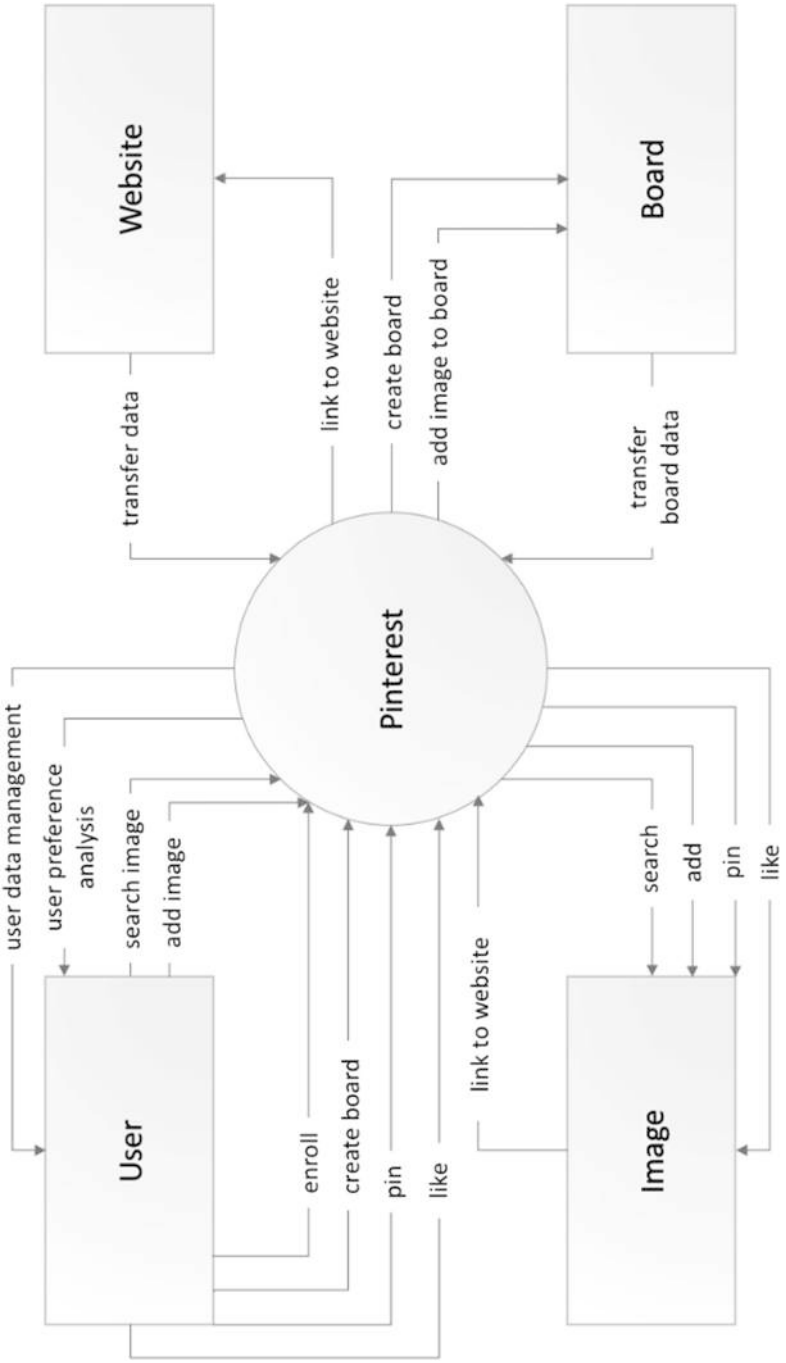

Fig. 11.13 Context diagram of pinterest (based on [97])

Previously, we discussed interface diagrams depicting how systems interact with each other. With digital solutions, the interfaces usually increase as seamless connectivity is more common. It is common for companies to connect with several channels such as web and mobile apps but also grant accessibility through third-party apps. All these different channels must be connected to the backend applications to register and manage orders. For example, when a flight ticket is purchased from a third-party app such as skyscanner.com, it has to be synched with the airline's systems to ensure that the customer gets a seat on the flight. API (Application Programming Interface) is used to facilitate such connections. APIs help with program-to-program interaction by specifying how communication between programs should be [98]. An example is Google who allow third-party websites to show Google Maps on their site [99]. Another is Facebook whose account can be used to log on a third-party website [100]. In Fig. 11.14, a high-level reference model of an interface map with API connections is depicted. The diagram is representing the digital communication between backend applications, the connecting system, API gateway and channels that are accessed by customers. This is done from the perspective of sending and receiving messages for system-to-system communication. The diagram is visually similar to an interface diagram previously discussed, which shows internal system interactions in a traditional business. Similar diagrams can be used to visualize interconnectedness, no matter which type of systems and solutions are used.

Solutions that use IoT solutions also require a form of interface map. A connectivity diagram which is similar to an interface map can be used. Figure 11.15 shows two-way connections between IoT devices, a gateway, cloud, and a server. For example, the elevator and escalator producing company called KONE has enhanced

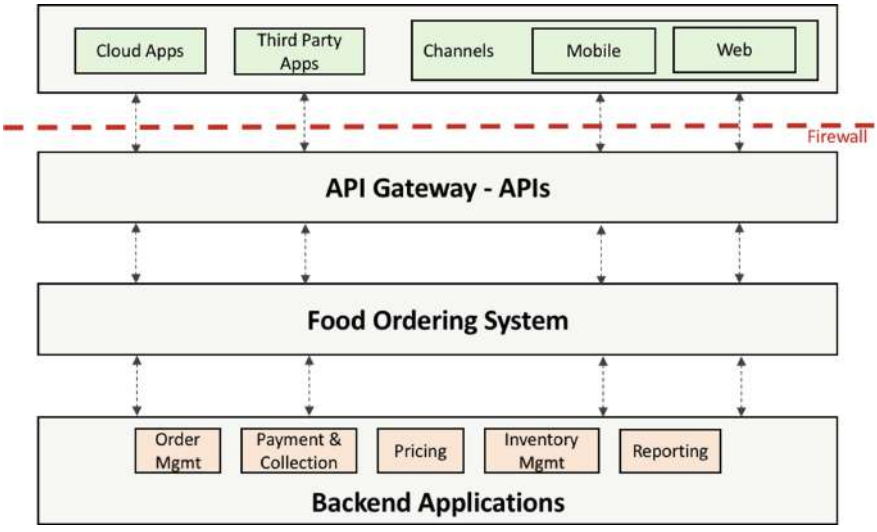

Fig. 11.14 Generic example of an interface map (based on[101])

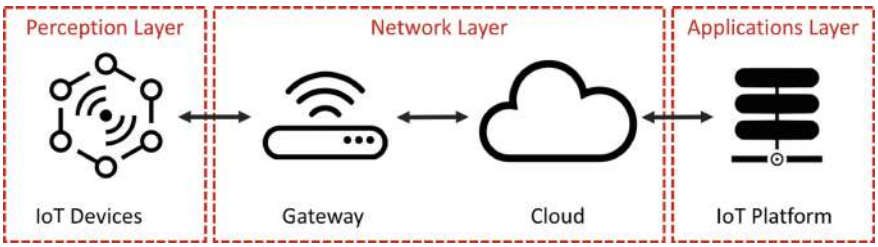

Fig. 11.15 Example of an icon based model (based on [103])

their products with IoT sensors, which enables live communication between elevators and programs that control them [102]. When several people scan their keycards, indicating that they are waiting for the elevator, this information is sent through the IoT gateway and the cloud to the IoT data processing platform. The data is analyzed, and a trigger is sent the same pathway back to the elevators, giving instructions on how many elevators need to be sent to the required floor. The same basic data and message traffic can be applied to any IoT device and service.

In essence, the two interface maps (Figs. 11.14 and 11.15) show the same thing but by using different methods. The API graph (Fig. 11.14) is using blocks and connecting marks, whereas the IoT model uses symbols to make the diagram appealing and understandable. This illustrates that diagrams can be notated in two basic ways depending on the purpose of the notation—technical or presentational [104].

When a traditional waterfall method is used, the models are also used for eliciting requirements. The models serve the purpose of representing the systems to the finest detail and once a model is laid out and agreed upon, the developer code is based on these models. In such cases, a technical model is preferred. However, when using agile methods, extensive models with many pages of documentation are avoided. Models become the basis of discussion rather than specifications. Such models serve the purpose of aligning all stakeholders' understanding. The results of the discussions are taken as input to build systems. As such, the models become a part of the process of designing solutions and not the design itself. For presentational purposes, a self-designed diagram is a better option than using a technical notation language that may not be familiar to all the stakeholders [104].

11.4 Business and Enterprise Architecture

Commonly, when working on a specific change initiative within an industry, others have tackled similar problems. This opens up for re-use. Business Architecture [105, 106] and Enterprise Architecture [107] are potential sources for re-use. These frameworks concern the enterprises and have produced models that are general. When discussing "process identification", we noted that many companies have

similar if not the same processes. The same applies to other aspects such as capability models. The degree of duplication allows the analyst to save considerable time by re-using such "reference models." One should bear in mind that reference models are generic and designed to capture the commonalities of many companies within an industry. They can be used as a basis but will need to be adapted according to the reality of the specific change initiatives. These frameworks also offer a range of different models for capturing different viewpoints that the analyst can use or draw inspiration from.

Business Architecture is about creating a common understanding of a business and aligning the strategic objectives with its tactical demands and aims at showing how ongoing initiatives (or needed initiatives) contribute to achieving strategic goals. This is achieved by blueprints (architectural descriptions of viewpoints) that help create a common understanding and enable aligning the tactical measures with the strategic objectives. As such, business architecture tends to stay at higher levels of abstraction when representing a business as it concerns the whole business and not specific initiatives or projects. This can contrast with the work of a business analyst who mostly focuses on a specific initiative. However, there are similarities between the results of a business architect and the work of a business analyst. Business architecture also uses models to represent a reality that overlaps with the work of the business analyst. A quick view of the aspects represented by business architecture shows the similarities such as stakeholder analysis, capability map, main process (value stream), products & services, and metrics.

Enterprise Architecture does not have a standard definition but in essence, it is about using the framework with all its different methods, guiding principles, and tools to aid a business to figure out, support and enable development and change that will align its IT infrastructure (including technical platforms, IT systems, processes, portfolios of projects and so on) with the strategic direction and objectives of the organization. In other words, Enterprise Architecture (EA) encompasses analysis, design, planning, and implementation of different projects to enable a business to execute its strategy. Enterprise Architecture, like Business Architecture, is geared more towards a holistic view and has a larger scope (enterprise or departmental level). Part of the work of an enterprise architect is to map the current and desired (future) state. In this work, tools, models, frameworks, and other instruments are used to help achieve this purpose. These overlap with the work of a business analyst and as such, offer a potential for re-use.

Enterprise Architecture has its own BABOK called "Enterprise Architecture Book of Knowledge" (EABOK) [108]. There are a few frameworks for Enterprise Architecture but the main ones are The Open Group Architectural Framework (TOGAF), [109] the Federal Enterprise Architecture, the Gartner Methodology, and the Zachman Framework [110]. The Zachman framework is the best known but not a framework as such, rather a taxonomy of how one can define an enterprise from different perspectives. It has a two-dimensional perspective where the first refers to what is being represented using the w-questions (why, what, how, who, where, and when). Each of these questions is captured at different levels starting with the highest ("contextual") and moving through "conceptual", "logical", "physical", and

ending at the lowest level of "detailed." Zachman's framework does not provide a method detailing how to elicit and capture all of the above models, nor does it exactly specify how each model is to be represented. However, it does provide a comprehensive map of what kind of models could be used to represent what viewpoint at which level. As such, it might be useful for the business analyst in his or her work.

We have seen that there are similarities between the Business Architecture and Enterprise Architecture frameworks and the work of the business analyst when defining the current state. These models can provide a starting point and be an important addition to the work of the analyst. Below is a list of common reference models that can be useful from the domains of Business Process Models, Business Architecture, and Enterprise Architecture:

- Association for Cooperative Operations Research and Development (ACORD) - Insurance and Financial Industries
- American Productivity and Quality Center (APQC) - Process Clarification Frameworks for a generic company and for additional 18 different industries such as Broadcasting, Education, and Telecommunications.
- eTOM and Frameworx - Contains a hierarchical catalog of the key business processes in the areas of strategy, operations, and enterprise management with the aim of enabling service-focused business.
- Information Technology Infrastructure Library (ITIL)—Guidelines and practices aiming at aligning IT with business needs in the domain of IT service management.
- Supply Chain Operations Reference (SCOR)—Reference model mainly for supply chain management covering process modeling and re-engineering, performance measurements, best practices, and skills.
- Value Reference Model (VRM)—Reference model for management and planning aspects of enterprise management, product development, supply chain integration, and customer relationship management (CRM), including metrics and best practices.

11.5 Digital Process Architecture, Digital Enterprise and Business Architecture

Enhancement of traditional models/reused models: Most of the models used in enterprise architecture and business architecture are originally designed for traditional (pre-digital era) businesses. The reused models may lack some viewpoints that are essential to digitalized businesses. In order to enhance the traditional modeling frameworks, the analyst could consider four aspects that are integral to the digital era. These are customer experience, data and analytics, IoT, and ecosystems [111].

Traditional businesses have set up their operation in a more inward-looking manner, i.e. focusing on optimizing from an internal perspective. However, in the digital era, the customer has become the focus. Becoming customer centric is more important. This means businesses have to consider the customers and their experiences to a much larger extent. Such a focus requires understanding and mapping of customer experience, i.e. identifying and analyzing all relevant touchpoints with the customer across all channels and media. This might also mean taking a look into business functions and partners that are directly influencing the interaction activities between the company and the customer [112].

Businesses have had data in their organizations but in the digital era, that data has become more easily accessible and analyzable. Methods allow for analysis of much larger sets of data in a matter of seconds as compared to the painstakingly long analysis time required before. Digital businesses have shifted the focus and decision support from gut feeling to data driven based. Information management and analytics are embedded into various systems and operations. It supports activities such as data-based decision making and process automation [111]. As such, data management and data analytics is an important and leading capability in digital businesses.

In the digital era, things are connected. In pre-digital era, businesses relied on reports produced after the events had taken place and acted in a reactive manner to delays, incidents, disruptions etc. That is not the mode of operation in the digital era. Digital businesses' mode of operation is real-time and proactively. With Internet of things (IoT), physical assets are connected to the digital infrastructure [111]. With its aid, businesses can monitor, optimize, and control smart objects [111]. Businesses can preventively detect faulty machinery or products [113], have real-time tracking in logistics or automating stock orders at stores or warehouses [114]. IoT raises the question of what physical objects can be and are connected to the grid, what data is and should be collected, and how this helps with improving the business.

In the digital era, operating within an ecosystem with connected businesses is more common as compared to pre-digital era. In an ecosystem environment companies leverage partnerships and interrelationships for mutually beneficial purposes [115]. An example of such an ecosystem is Amazon, which brings together other companies to provide a seamless shopping experience from search to door to door delivery, no matter if the customer is looking to buy a technical gadget, a t-shirt or groceries. The main concerns of building or being a part of an ecosystem are API management, control and security [111].

Architectures were born of the pre-digital era and as such, might not fully accommodate some of the aspects inherent in the digital era. That does not render them obsolete, they still have much value but with adaptions. The analyst, when using architecture frameworks, should have customer centricity in mind and consider data management and analytics as also key. Likewise, the analyst should think of real-time and preventive mode of operation and finally, consider that in the digital era, businesses are not stand-alone entities but more part of an ecosystem.

11.6 Summary

Defining the current state is predominantly about gathering facts and data, eliciting information, creating a common understanding of the current situation, and analysis. In mapping the current state, we use models as they are very helpful, but the analyst should be cautious. Business analysts are analysts and as such, they use models as tools that serve to assist the analyst in making an analysis. As such, the models must not become the end objective. In fact, different models highlight different viewpoints of reality in a simplified manner. They do not tell the whole story, and some facts and information can remain un-captured in the models. The responsibility to use the models to unravel such facts, to draw insights, to identify areas where more information is required, rests with the analyst. Models cannot replace the business analyst, so the analysts should not replace their analytical ability with models.

In a similar vein, analysts should be cautious not to overdo the modeling. Using models for the sake of models is an expensive activity. Each model created can be time consuming and by creating models that are not needed, time and resources are used inefficiently. A more efficient way is to begin with the essential model and as needs are identified, detail and create new models that capture additional viewpoints. Another way to save time is the re-use of previous work, and as we have already discussed. This applies to finding suitable models to express certain viewpoints and to replicate similar business maps. The business analyst has to use an analytical mind to unravel the facts, gather information, create models, understand, and make analysis relevant for the purpose at hand. In doing so, the actual process of creating models is valuable in itself because it gives the stakeholders and participants a common foundation, understanding, and framing of the current state. When this is achieved, the analyst can move on to identify, clarify and define the issues.

Chapter 12
Problem Analysis

In the previous chapter the business need(s) and the mapping of the current state were discussed. In that analysis, we uncovered how the state of things that give rise to issues and problems is. We most likely got a good number of clues or indications without explicitly stating them. Knowing the need and the current state, allows for figuring out what the problems are, or what is the reason behind a need or an issue. Usually a bad process supersedes people. No matter how skilled a resource might be, working in a bad process will cause problems and it will be necessary to address the weaknesses of the process. Problem analysis is identifying and evaluating the reasons for the existence of a problem or a set of issues. Before discussing problem analysis in more detail, a few notes should be addressed.

Business analysis is not a linear or straightforward process. During the stakeholder analysis, or current state analysis, many will present their views on the problem, their perception of why issues exist and how it should be solved. The analyst cannot rigidly wait to gather such information but must be flexible and collect the data. As such, problem analysis might become a process that begins much earlier and continuously evolves until it matures. Perhaps it has been solved by the time the analyst has come to this step.

Secondly, although stakeholders are aware of the main problems, problem analysis has an important role. It is not enough to have an idea of what the problems are, one also needs to understand which aspects are causes and what are the effects. Problem analysis outlines and maps these relations, allowing for the analyst to identify and verify the root causes. Furthermore, given situations where there are several problems, it is necessary to prioritize them. To this end, problem analysis allows for identifying which problems are to be addressed first.

Thirdly, although it is called problem analysis, it does not necessarily have to apply exclusively to cases where there are problems. When root cause analysis is used, it is a "reactive analysis." Problem analysis can also be used for "preventive analysis." An organization might not have any particular issues but have plans to expand their business into new markets, increase their volumes, or reduce their costs. In such cases, the initiative is not motivated by a particular problem but rather

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driven by an improvement, a desire to capitalize on an opportunity, or simply to increase efficiency. The primary question might be "what do we need to do in order to achieve X." If a company wishes to increase its volumes, they could look at what is lacking to enable such an increase. The same question could be rephrased as a problem ("what are the issues preventing us from increasing volumes").

Finally, the process of reaching to the core of a problem can be challenging with many reiterations that require revisiting some questions several times. Had the issue been easily solved, there would not have been a need to analyze the matter. As such, the analyst should expect a few turns, friction, restarts, and opposing views in this process. However, it is of vital importance to know what the problem is before setting out to solve it. Lacking a solid understanding of the problem and the causes can easily lead to a path where solutions look good but do not solve the problems.

12.1 Overall Problem Analysis Process

The process of root cause analysis has four main components [3, 116]. These are, as illustrated in Fig. 12.1, "define problem", "collect data", "identify cause", and "identify action".

Note that these different steps are seldom executed in a linear manner but can be re-visited iteratively. The first step is to define the problem and then there will be iterations between collecting data and identifying the cause. It is not always easy to know what data to collect when identifying the root causes, as further data might need to be collected. It might happen that the problem definition needs to be revisited and modified and the analyst should be open to going back and forward in this process. It is preferable that the identifying action step is left to the end but might be touched upon during previous steps. Although there are many different methods of conducting root cause analysis, most, if not all, include these main components listed above. In this chapter, we will focus on these components and present a few of the most common root cause analysis methods.

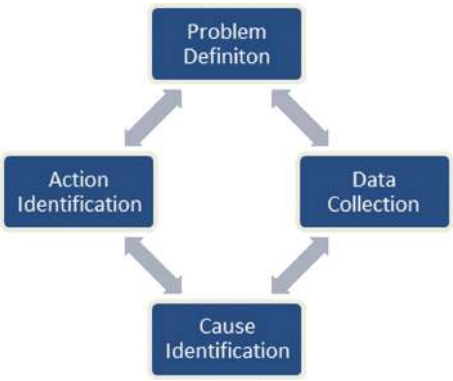

Fig. 12.1 Root cause analysis components

12.1.1 Problem Definition

It is important to have agreement on what the actual problem is. A way to achieve agreement is to begin with a problem statement and review it with all relevant stakeholders. As input is received, the problem statement or definition can be modified and further clarified. There might be some conflict or different perspectives. If it is different perspectives, the definition needs to accommodate all aspects, as it is relevant to understanding the problem. If there are conflicts, then the analyst will need to resolve the differences and come to an agreement.

A problem description or statement could include the following aspects:

- A description of the problem.
- A description of who the problem affects (stakeholder).
- A description of how the problem impacts the stakeholders and their activities.

The sales order of a company might begin with the following problem:

- The sales orders have a problem with inaccuracies.
- This affects the sales order division, customers, shipping, and the customer service department.
- The problem results (impacts) in increased scrappage, higher handling costs, and dissatisfied customers.

We note that many aspects of problem definition might have been raised earlier in the analysis process. As stated previously, the analysis process is iterative, and it is only natural to discuss problems early on. In such cases, there is great potential for re-use. However, one should bear in mind that early discussions concern perceived problems. At this stage, we move from perceived to verified.

12.1.2 Data Collection

Ideally, data has been collected during the current state analysis. If that be the case, this stage requires the data to be compiled or filtered to weed out irrelevant data and focus on the data that matters. It is possible that the data collected might be more general than required for this particular context. In such cases, the analyst will need to be more specific in determining what data to collect and proceed with. However, if the required data is unavailable or metrics not easily quantifiable, the analyst needs to find "good enough" proxies. The type and amount of data required to collect will vary with the problem. Nevertheless, a well-defined problem will also guide the analyst in this regard. Generally, the data concerning a specific problem should give information about the magnitude, the location, the timing and the effect or impact of the problem.

12.1.3 Cause Identification

Gaining agreement on the problem and how it affects the different parts of the operation explains the results of the problem but not why it exists. To understand why the problem exists, it needs to be examined in more detail. By asking the right questions, the relevant problems can be identified, its real causes unraveled, and solutions designed to resolve them. The issue can be a mixture of several causes. Furthermore, not all causes of a problem are equally "causing" the problem. The analysis of the causes of a problem covers these aspects and it should be borne in mind that there is a difference between a cause of a problem and a symptom. Decreased sales is not a problem but rather a symptom of a cause that is associated with the drop. With problem analysis techniques, the root causes are identified. There are several methods to achieve this. While no single method is the best, it is safer to use at least two methods, to ensure that something important is not missed. Below we discuss a few methods and aspects to consider when conducting problem analysis.

12.1.3.1 The Five Why Method

The "five why method" [117] is a simple method to elicit the root cause of a problem. The idea is to start with a problem and asking the question "why" five times. Every iteration (every time a "why" is asked) elicits a deeper cause of the problem. Consider the problem of customers returning a laptop.

1. Why are they returning the product?
   Answer: Most of them return the laptop because it is scratched or dented.
2. Why are there scratches or dents on the laptop?
   Answer: We inspect them before shipping, so it must have happened during the shipping process.
3. Why are they damaged during shipment?
   Answer: Because they are not packaged according to the specifications.
4. Why are they not being packed according to the specifications?
   Answer: Because they do not have the specifications.
5. Why doesn't shipping have the specifications?
   Answer: Because shipping specifications are not included in the product release process.

In the above example, the root cause of the problem is related to specifications associated with product releases. This illustrates that there might be a deeper reason why a problem occurs. However, in real life, the process is not quite as simple. Two aspects make it complicated.

First of all, it might be easy to answer the question but how do we know that this answer is actually valid? In the example above, how do we know that the returns are due to scratches or dents? This answer might be one of five or six alternatives but

this one was chosen because it could be substantiated by facts. Perhaps the attached documents of the product returns were examined. Having analyzed a random sample, most of the customers stated a scratch or dent as the reason. There might have been other reasons such as not liking the color, the product was not as they expected, but the main reason was due to scratches and dents. Had the majority of reasons been that the product was not as it was marketed, then that would have been the answer to the first why question. When conducting such exercises, it is vital that the analyst does not blindly accept the first answer but makes sure that answers are backed up by facts. Also, note that if the analysis had shown that the two main reasons for returns were scratches and customers expecting a different product, then both these issues would have merited their own root cause analysis.

In some cases, the "five why" method can be combined with a root causes analysis tree diagram which graphically depicts the possible alternatives for root causes. It begins with placing the apparent or obvious problem at the top. At the next level, symptoms of the problem are placed. Then, each following level corresponds to the answers of a "why" question (see Fig. 12.2). It is possible to graphically present the diagram lying down i.e., putting the "obvious problem" to the left side and each layer as columns to the right.

The tree diagram depicts one of the "five why" questions at each level. There are proposals to include softer cultural issues, also called "latent causes", in the analysis. Such causes would reflect the values and attitudes behind the root cause. If a company has unraveled a number of fake customer accounts, the root cause might trace the issue back to the lack of validating customer data. However, the fact that the sales force entered fake customer accounts might be rooted in a bonus scheme, where those who fail to meet a certain minimum growth rate, will be left without a bonus or fired. This culture is a latent cause of the problem. The latent cause could also be on an individual level. If an employee has used company funds

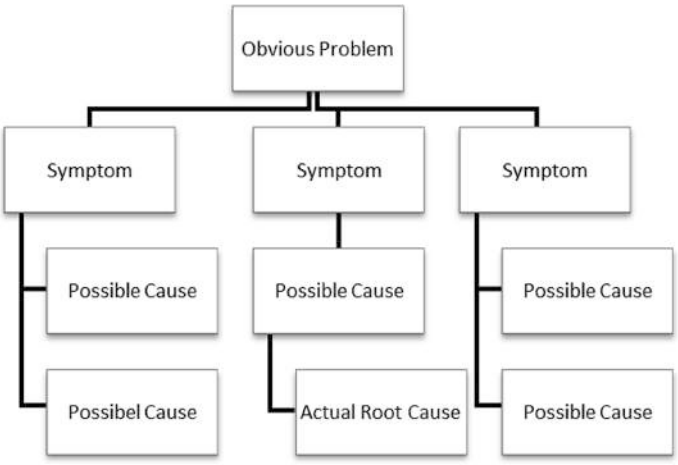

Fig. 12.2 Tree diagram of root causes

for his or her own personal use, the root cause can point to some routine, but the latent cause is the values and attitudes of the employer. The analyst will need to assess if it is helpful to seek the latent cause.

The "five why" method originated from Toyota and was used in a manufacturing firm setting and dealt with issues that had an objective and "correct" answer. If a machine was leaking oil, asking why would lead to an answer. There is little room for interpretation in such a case as it is not a matter of opinion but facts. However, when applying such a method on softer issues such as "why is the time to market for new products so long", there is no simple answer or one that can be backed up with facts. Asking "why", serves no purpose, and the analyst, having identified an issue, must ask different questions, such as "how come", "what makes you think that", "how does that work", "what is the relation there" and so on. A few lines of questions that might be of assistance, although not a guarantee, to reach the root cause are as follows:

- Has this problem occurred once, repeatedly or is it constantly present? If so, how often does it occur and what are the probabilities of it occurring again?
- Does the problem occur at specific times or is it random? Do we see any correlation between the occurrence of the problem and any other events?
- Were there any warning signals or indications that could have foretold the occurrence of the problem? If so, what were they and how were they indicated?
- Given the cause of the problem, would a solution to this cause completely remove the occurrence of the problem or could it occur again? Are there any other factors involved?
- Is the problem an isolated matter, or does it affect, get affected by events or responsibilities within other departments? If so, what and how do these things affect and relate to the problem?

The analyst must be very analytical, focused, and open to ensure that the answer given is reasonable before proceeding to the next "why". Failing to do so, will limit the effectiveness of the method.

Consider a company that has an issue with time to market. In essence, they are not able to introduce new products fast enough. It might take months to introduce a new version whereas their competitors do it in weeks. In asking why, an inefficient IT prioritization structure might be given as the answer. If the analyst accepts this and moves on, it would have led to restructuring internal policies for prioritizing IT projects. However, that might not solve the problem. Therefore, great caution must be taken to ensure that the answer is reasonable, relevant, directly related to the issue, and not a symptom.

When conducting the "five why" method, it is better to do it in a workshop setting because there will be many discussions, explanations, and collective analysis. It is also important to consider all the aspects and build agreement before moving on to the next level. In the workshop, the analyst must be careful to elicit causes, rather than symptoms, and assist in making that distinction. In this process, it is also important for the analysis to be conducted step by step, for the participants

to be precise, use facts and data, and not jump to conclusions because "it is obvious". Furthermore, it is important to focus on the process and not the people. Reasons such as "human error" or "lack of attention" are usually not the root cause. The objective is to find those root causes that once removed, will result in the error not occurring again.

The "five why" method is not free of pitfalls. It is not a perfect method and can be problematic as it has its limitations. It is all too easy to stop at a symptom because it seems to be enough. Furthermore, finding the root cause can prove to be difficult, especially if the root cause lies beyond the knowledge area of those participating. Another limitation is the extent to which the method can be repeated with other participants and give the same root cause. If the same issue is analyzed with the "five why" method but with other participants, would the same root cause be identified? It is difficult to say but for this reason, it is important to have the right persons present. Finally, there might be more than one root cause. While this is to be accepted, it must also be ensured that only root causes are identified.

12.1.3.2 Fishbone Diagram

Sometimes the problem has more than one root cause. If the five why method is applied alone, there might be a risk of too much focus on one root cause. A method to elicit many causes and trace them is the "Ishikawa diagram" or "cause and effect diagram". It is called the "fishbone diagram" [86, 118] due to its shape (see Fig. 12.3). A fishbone diagram allows conducting complex root cause analysis when there are several root causes or when the combination of different root causes creates a problem.

The fishbone diagram represents the cause and effects as a graphical model. The diagram has the structure of a skeleton of a fish where each major bone is a primary or main category of the cause of the problem. These categories are predefined as being methods, measurements, machines, materials and people. It should be noted that the fishbone diagram has its roots in the manufacturing industry and the categories are defined accordingly. However, it is possible to change the categories and adapt the structure to a specific problem. It would also be possible to begin the discussions without any main categories and progressively cluster causes together and later define the categories. Flexibility is important to ensure that the results needed are achieved.

In workshops or brainstorming meetings, the different causes are discussed and listed under the relevant main category.

1. The first step is to put the problem at the "head of the fish".
2. The next step is to identify the main causes of the problem. The main categories can be set up according to above.
3. At this point, the main categories are set but not sufficiently to see the specific root causes. With brainstorming and data collected, the specific root causes can

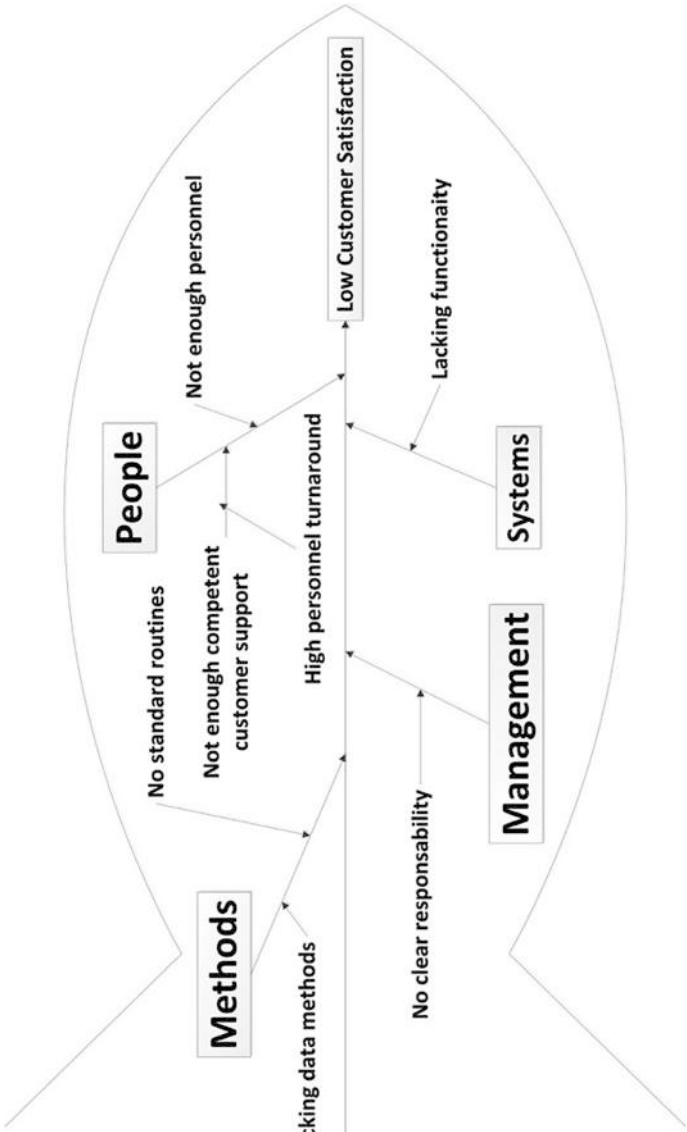

Fig. 12.3 An example of a fishbone diagram

be identified. There might be a need to create sub-categories under each main category.
4. Identify the specific causes and place them in their right category. If a cause is related to an information system, it is put under "machines" or a category defined as "IS support systems". For each of the categories, potential causes are identified and added to the diagram.
5. Discussing the possible solutions to the root causes are also part of the fishbone diagram method, where the solutions are first drafts and will require further investigation at later stages.

Let us examine a simple case of low customer satisfaction. As can be seen from Fig. 12.3, the problem is stated at the head of the fish. Then, through discussions, main causes are discussed. As the discussion continues, the main reasons are captured and for each main reason, the secondary causes are identified. If an online shop has low customer satisfaction, the main reasons might be people, methods, management, and systems. Each of these will have its own secondary causes such as high turnover of personnel that leads to low or average competence levels when dealing with complaints and issues.

The fishbone diagram was created for a manufacturing environment where there is a higher degree of objectivity and in lean manufacturing and similar philosophies; these methods are used together with statistical analysis. In "softer" industries, it is not as straightforward to conduct these analyses. There might be many opinions, perspectives, wishes that are not easily supported or disproved by the data that can be collected. In such cases, the many causes discussed are not as clear as to become statements but rather an iterative process between discussions, data, and facts until a common understanding is reached.

A fishbone diagram assumes there is a problem that is broken down by its causes and the starting point is therefore, a specific problem. A company might have a problem with decreasing sales or increased product returns (bad quality) and in such cases, a fishbone diagram is applied. However, in some cases, there might not be a specific problem but rather something that the company wants to achieve. A company might wish to take strategic actions to increase their sales or improved conversion rate. The fishbone diagram can be used but with one difference, rather than asking questions geared towards why a certain problem occurs, the questions needs to be "what do we need to do in order to achieve a higher conversion rate?" In essence, it is the same but flipped from seeking causes to finding enablers.

Perhaps you have noted that the fishbone diagram is quite similar in many ways to the "five why" method, in particular when it is graphically represented as a tree diagram. Both are essentially asking the same questions ("why" vs. "what causes") but there are differences. In the "five why" method, the focus is geared towards finding maybe one or perhaps a few root causes. The fishbone diagram, on the other hand, illustrates and categorizes all the possible causes and gives a more nuanced view of the interplay between causes. Most root causes analysis methods will have the same components, and all will ask about causes so similarities can be expected.

12.1.3.3 Interrelationship Diagram

Interrelationship Diagram (henceforth ID) [119], also sometimes referred to as relations diagram, has its origins in the 1970s. Similar to "five why" and fishbone diagram, its original use was in the manufacturing industry but it can also be used in other contexts. Its main function is to capture the logical or causal relationships between factors related to a complex problem or in other words, represent a cause and effect analysis. The elements of an ID are boxes or ovals for each factor and arrows drawn between these boxes to show the relationship between them. There are no set rules for how to organize the boxes, but the following three types are used most.

- The first is centrally structured which places the main issue at the center and the most directly related factors closer to the center.
- The second is to put the main issue or issues towards one side of the diagram and arrange the factors on the other side.
- Thirdly is having no prior organization of the boxes but letting it grow as the process proceeds, which seems to be the most common one and the one we will use.

The factors can be of qualitative or quantitative format. In qualitative format, the relationship between factors is determined by discussions whereas in a quantitative format, the relationships are identified based on numbers.

As can be seen from Fig. 12.4, the relationships between the factors are captured and illustrated with arrows. We can see that the issue of "salary" affects or has an influence on "personnel turnover". We can also see that the lack of methods can affect the clarity with regard to responsibility and lack of competence. In other words, low salaries are a cause of personnel turnover and lacking methods causes confusion about responsibility and low competence.

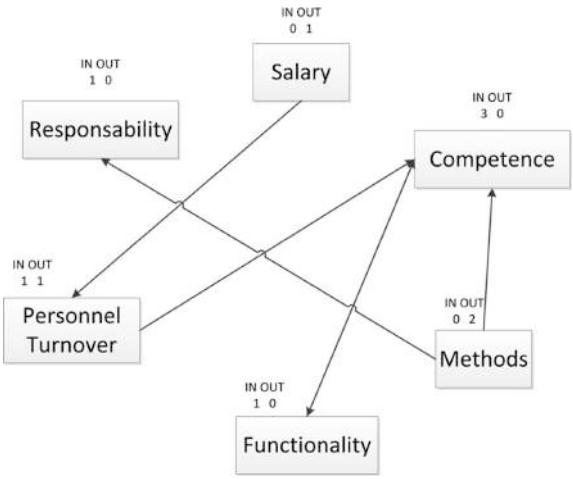

Fig. 12.4 Example of interrelationship diagram

An ID is created by following these main steps:

1. Determine the label of the factors i.e. define the issue and factors. This is done following a general discussion about the topic in order to unravel or filter out the indirect influences. It is important to be specific and clear when defining the issues. Failing to do so will cause ambiguity that affect the quality of the analysis.
2. Then place the factors on a whiteboard or some similar space. This could be done according to the different structures discussed above. Figure 12.4 is an example of having no predefined structure.
3. Following this, assess the relationships between each factor with the other factors. Draw the arrows from the issue that influences or causes the issue to be influenced.
4. Find the root causes by counting the arrows. All factors that have more outgoing arrows than ingoing arrows are causes. Similarly, all factors with more incoming arrows than outgoing are effects.

In our example, we see that the factor of competence has 3 ingoing and 0 outgoing arrows, and that method has 0 ingoing and 2 outgoing arrows. Our analysis is then, that method (as it has more outgoing arrows than incoming) is a cause while competence (as it has more ingoing arrows than outgoing) is an effect. As such, the problem seems to be more in methods than salary. ID is another way to represent the cause and effects but at its core, the discussions will still revolve around "why", "what causes", and "what is the relationship". Also, there is an additional nuance introduced with ID.

12.1.3.4 Pareto Analysis

Pareto was an Italian economist who, at the beginning of the 20th century, noticed that 80% of the land in Italy was owned by 20% of the people. The "Pareto rule" [120, 121], also known as the "80/20 rule", simply states that 80% of any given output is determined by 20% of its input. The application of this rule states that 80% of sales come from 20% of the customers or 80% of sales comes from 20% of the sales force. The rule seems to apply in other areas as well, and it is not uncommon to find that by addressing 20% of reported bugs, about 80% of system errors would be eliminated.

In the context of root cause analysis, it is highly likely that 20% of the root causes make up for 80% of the problem. As such, there are certain root causes that are more important to focus on. By addressing 20% of the causes, 80% of the problems will be resolved. In other words, it is not worth addressing all root causes as many of them will have a very marginal effect on the problem but will certainly cost to fix.

By using data, reasoning and understanding the anatomy of the problem and its root causes, the 20% root causes that cause 80% of the problem are identified. It might even be enough to address these issues that make up the 20%. Setting up a

Pareto analysis is about using data. The analysis aims at finding what constitutes the 20% that causes 80% of the problem. Once the data is gathered, creating a Pareto chart is quite straightforward with Excel or Google Sheets.

Let us assume that the online shop we have used as an example previously, conducted a customer survey to investigate why customers are dissatisfied. Having conducted the survey, they categorized the complaints according to Table 12.1.

Having sorted the complaints by frequency (highest first), we can easily calculate the cumulative number and the percentage of each category (columns 3 and 4 in Table 12.1). In Fig. 12.5, the category of complaint and its frequency is plotted against the cumulative percentage. The 80/20 relationship becomes more visible in a "Pareto chart".

The 80/20 rule does not apply perfectly in all cases. The ratio will differ, but the main point remains, namely that a few causes count for the most effect. Looking at the Pareto chart gives you a better understanding of where the effort should be made to solve the problem of low customer satisfaction. It is clear that by focusing on resolving the issues of support staff not knowing how to solve issues and, in some way, reducing the time to take on a new issue, the best effect will be achieved. However, without such an analysis, focusing on improving the site stability, or adding more information to the web page, might not result in significantly improving customer satisfaction.

12.2 Data and Analytics in Problem Analysis

Problem analysis should be a combination of qualitative and quantitative analysis. Problems are often identified in discussions but there is a difference between opinions and facts. Opinions are ideas that are not supported by data. While it might

Table 12.1 Count of complaints per category

Customer survey results	Count	Cumulative count	Cumulative count in %
Customer support did not know how to resolve the issue	186	186	44.08
Took a long time to get hold of customer support	146	332	78.67
Could not find info on web page	29	361	85.55
I got my answers several days later	15	376	89.10
I was not notified when the issue was resolved	12	388	91.94
Links do not work	11	399	94.55
My issue was bounced between several persons	9	408	96.68
Site crashed	8	416	98.58
I had to describe my issue several times	6	422	100.00

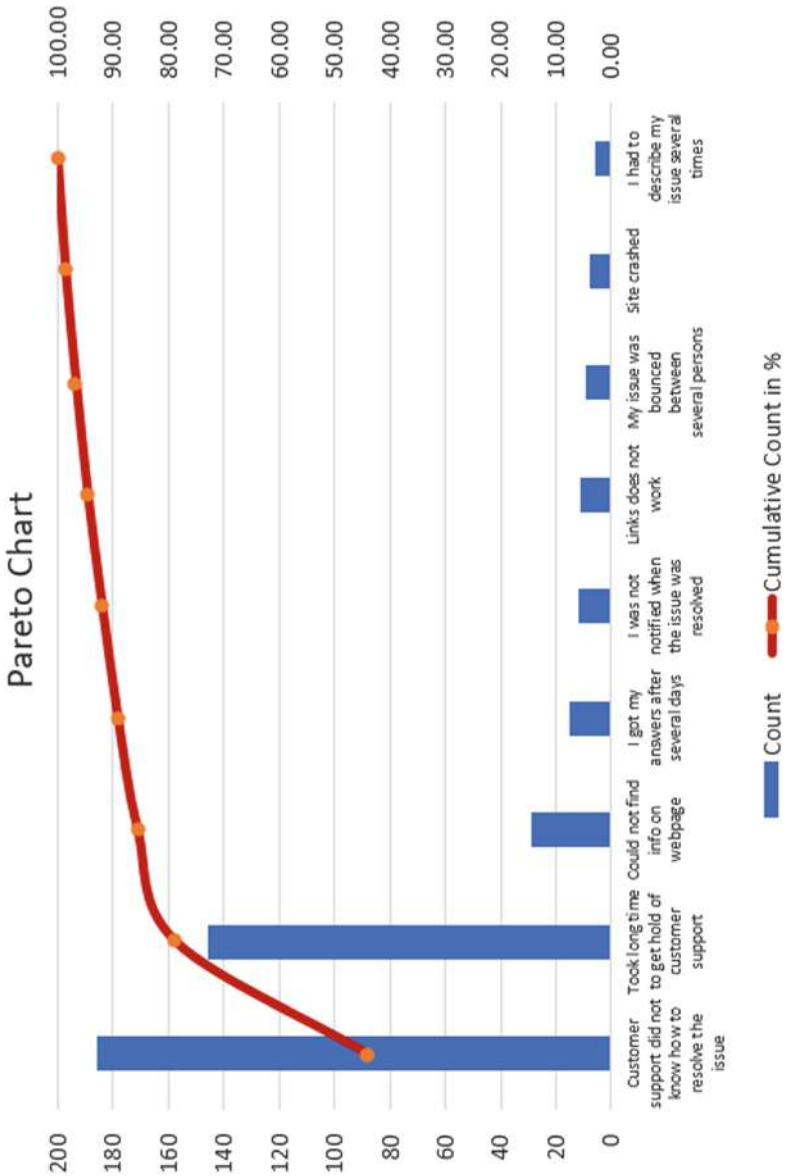

Fig. 12.5 Pareto chart

not be possible to support all perceptions of problems with data, conclusions should be made based on quantifiable data wherever possible. Let's consider the example of low customer satisfaction at an online store, which was analyzed using the Fishbone method (see Fig. 12.3). One hypothetical reasons of low customer satisfaction stated was "not enough personnel". Even if all the stakeholders agree with this statement, the analyst should back this opinion up with data. How many employees are there to help online clients? How many clients visit the store? How much time does one customer need? How many employees are needed to service all the clients in a satisfactory way? Asking such questions and being data-driven in finding answers, helps to verify or falsify the reason born of the discussions. Perhaps there is perceived to be a lack of personnel because employees are burdened with outdated processes requiring a lot of manual work.

Data analysis can play an important role during problem analysis. Analysts always want hypotheses to be tested on data, but such data is not always readily available or accessible. The issue gets more complicated as, when doing current state analysis, the analyst may not know exactly which data will be required in problem analysis. One strategy to reduce the time required to find new data, can be for the analyst to get a good overview of the data available and how to access it during the current state. If the analyst is prepared in such a way, relevant data can be retrieved quickly whenever needed during the problem analysis.

Chapter 13
Future State Analysis

Having identified the business requirements (needs) at an appropriately higher level of granularity, captured the current state, and defined the problems facing the company, it is time to consider scenarios where the problem is addressed. As such, the main purpose of defining the future state is to determine what needs to be in place or necessary conditions to address the business needs. At this point, detailed solutions are avoided although it might be tempting to follow in that direction. The alternative solutions and the final solution selected will be detailed later. At this stage of the process, focus is directed towards gaining consensus among stakeholders about the outcomes of the change.

There are no set rules on how to describe the future state, essentially it is the same as the current state description. Depending on the size of the initiative, the future state description can be confined to relatively minor changes in existing processes or focus on modifying features of existing software solutions. The future state description can be comprehensive if it concerns modifying, adding or removing significant parts of existing solutions, organizational structures, entering or leaving markets, or dealing with a combination of two or more solutions (such as applications, data, and processes). The future state description might include (but not exclusively) the following components:

- Organizational and functional structures
- Knowledge, skills, and competencies
- Facilities and organizational locations
- Business processes
- Data and information flows and structures
- Information systems, interfaces, and architecture
- Technology infrastructure

The future state can be described with diagrams, models, statistics, text, in any combination. Such components could be those, but not necessarily the only ones, used to describe the current state. Although it is not necessary to match the

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components used in current state to describe the future state, there are advantages in doing so. Generally, it is easier to discuss the future state if there is a starting point in the current state and being able to compare and contrast the current with the future state description enables the analyst to ensure completeness (not missing important parts). Finally, the gap analysis which we will discuss shortly is easier if most of the components are used for both current and future state description.

Note that the components used to describe the future state do not have to perfectly mirror those of the current state description. It is possible given sufficient overlap to ease the analysis, although it is difficult to state exactly how much the overlap should be. However, it might be useful to reflect on the main (backbone) components used in the current state description that are present in the future state description.

When working with digital technologies, it is imperative to consider how such technologies can enhance the solution. The future state should communicate the vision of how digital technologies will enhance the solutions, deliver value, and enable further development towards even greater value creation. If an IT system is replaced with a newer version, the focus is perhaps more on added functionalities and resolving performance issues. For instance, if a customer support system is replaced, it might offer new functionalities such as chat and better user interface. That would perhaps suffice. Incorporating digital technologies might mean incorporating a chatbot and on top of that, capturing the vision of softbots and virtual assistants. Digital technologies enable not only a problem to be solved but also, future value to be added and such value should be reflected in the future state analysis.

In essence, defining the future state serves to draw the lines within which alternative solutions can be generated and evaluated. A company that struggles with long time-to-market for new products has mapped their current state and has a good understanding of the causes. The analyst continues with working on the future state. At this stage, it is not about outlining a possible solution or listing different ways the problem can be solved. Rather, the focus is on setting the parameters that can be used for finding different solutions. As such, it is important to define what "success" means or in other words, define what outcomes or results are to be achieved when the problem has been solved. In the context of this example, it might be worth mentioning that time-to-market for simple variations of existing products should take no longer than 2 weeks and for completely new products, it should be less than 2 months. Furthermore, the future state should clarify the potential value such outcomes have and clarify restrictions that are in place. The company might find the potential value to be an increase in related revenues of 30% and/or gain a reputation as being at the frontier of product innovation. The company might have financial restrictions, or there might be other limitations that must be considered such as current technology. Once these aspects are captured, it is possible to ensure that stakeholders are in consensus about the future state.

The future state provides the "frames" within which alternative solutions can be generated, investigated, and assessed. As such, the future state is an input to the change strategy. The level of detail should not be overly vague or detailed. It is not

wise to standardize the level of detail as it is contextual. It is appropriate if the level of detail is enough to achieve the following points listed below:

- Allowing the generation and assessment of competing ways the future state can be achieved (input for change strategy).
- Give a clear definition of the results (outcomes) of the target state and the value of the target state (in relation to the business needs and problem statements).
- Outline the scope (delimitations) of the solution.
- Gain agreement among key stakeholders.

Managing the trade-off between being too general and specific, is one of the more challenging tasks of an analyst. One might reason that it is always better to have more detailed solutions. While this might be true in some cases, one should consider the time and cost of getting detailed results. Detailing a future state too much, will leave little room for finding ways to achieve it and thus, discard creative ways. While trying to maintain a good balance between being too vague and too detailed, some areas might deserve being analyzed in more detail. Initiatives have a few key areas that make up the lion share of the solution. We have already discussed the "Pareto rule" or the 80/20 rule as it is sometimes called. Following this rule, we find that 80% of the sales are generated from 20% of the sales force. The same principle usually applies to initiatives and solutions. Many times, 20% of the functionality (of the solution) enables 80% of the value of the improvement initiative. These key or critical areas are very important and therefore it is highly desirable to explore them more. The negative consequences are greater if anything is missed, overlooked, or not analyzed. To reduce such risks, it is wise to spend more time on key areas.

For this purpose, i.e. gaining consensus among stakeholders, the future state should be defined at a level that delivers (1) clarity about the outcomes of the change and how these changes will satisfy the business needs, and (2) setting the parameters within which alternative solutions can be identified, compared, and assessed. In fulfilling these points, the future state description needs to work with the following points:

- Business Goals and Objectives to create clarity as to what is to be achieved and set the foundation for how the project should be evaluated after its implementation. This part also includes understanding of how the change generates potential value for the company.
- Define the Scope of the Solution space, i.e. define within what range, alternative solutions are to be considered. This will allow the analyst to focus their work to generate alternative solutions and assess what kind of complementary competency and knowledge skill will be required.
- Clarity constraints.
- Assumptions that must be considered.
- Impact on the organization.

We note that some terms such as goal and scope are recurring. We discussed scope when considering the analysis approach, the current state, and again now in the future state analysis. First of all, when discussing goals and scope when planning the approach, we are concerned with the analysis work itself. During the current state analysis, we consider areas of interest for analysis. Here, we focus on the effects we wish to achieve. As such, goals and scope are recurring but for different purposes. Secondly, as the analysis process progresses, greater clarity is achieved. That in itself merits refinement of goals and scope.

13.1 Business Goals and Objectives

In the current state analysis, we discussed business requirements as expressions of the needs that motivate or explain why we are doing the initiative. However, they were at a high level and serve more as a compass to guide and point us in the right direction. In the future state analysis, we need to become more specific about what we want to achieve. This can be done by goals and objectives.

Goals are qualitative statements that express what the company wants to achieve. A company might have as its goal, creating a new capability such as introducing a new product or service or a desire to create a new capability for a higher degree of innovation, or improving profits by extending its business to new markets. Goals can also concern internal aspects such as improved safety or higher employee satisfaction.

Such high-level goals, while more concrete and tangible than business requirements, can be broken down into more tangible parts. These parts that result from decomposing a goal, are called objectives. In future state analysis, goals are defined and decomposed into parts that are increasingly tangible. These objectives should be more specific. To assess if the objectives are specific enough, one can examine if they are "SMART", first introduced by Doran [122]. This acronym stands for the following:

- **S**pecific – the objective should describe an outcome that is observable.
- **M**easurable – the outcome should be measurable, and the data required for measuring should be accessible.
- **A**chievable – the outcome should be possible to achieve using reasonable effort.
- **R**elevant – the outcome should be aligned with the vision, mission, and goals of the company.
- **T**ime-bounded – the outcome should be achieved within a defined time frame.

Note that the goals and objectives do not state anything about the solution, i.e. they do not make any statements on how goals are to be achieved. The focus is on the desired outcomes and the impact after the solution has been implemented. In order to get a fuller and a common understanding of the outcomes, quantification of the objectives is very helpful, if not necessary. Assessing and assigning a numerical

value on goals, is a part of a "SMART" goal. In other words, a discussion about impact should include both qualitative as well as quantitative impact in order to better understand the goals.

An understandable confusion on this point might be the differences and the similarities of business needs, business requirements, goals, and objectives. These terms have not been defined in a standardized manner and they overlap in how they are described. It is important to avoid getting caught in a semantic circle. However, one way to understand these terms and their relation to each other is to consider them as a hierarchy where every level adds details of clarification. The hierarchy is formed as the following:

- Business need(s) is a high-level statement expressing the impact or effect an organization wants to achieve. In the example, we used previously (reducing time to market for a financial institution), the business need could be expressed as keeping up with competitors in order to defend market share and thereby their profits. If they had not been under pressure from competitors, they could also have expressed their need as getting more out of a very lucrative market by increasing the volume and therefore, their profit.
- Business requirement captures the need in slightly more tangible manner. It expresses what is required, from a business perspective, to resolve the problem or satisfy the need. For the financial institution to keep up with competitors, they are required to build capacity to manage and deliver new products. If they seek to increase their volumes, they might require automated processing. These are the requirements that need to be fulfilled in order for the financial institutions to satisfy their need. In short, business requirements express, at a high level, what is required to solve the problem, satisfy the needs, and create the desired impact.
- Business goals decompose the business requirement into its main components by determining the main set of states or conditions that must be in place to fulfill the business requirement. The goals set by the financial institution might be, to reduce time to market for new products, reducing manual processing, and create new services that enable straight through processing.
- Finally, the objectives break the goals into smaller, tangible, measurable sub-goals or metrics that can be used to measure the progress made towards achieving their parent goal. In the above case the objective concerning time to market might be "to implement a new product and offer it to the market in less than a week", which is easy to measure and determines if the objective is fulfilled.

Perhaps you have noted that the lines between the terms above are blurry. They are, and they are not, always easily demarked from each other. Neither are all levels always necessary. The important thing is to have a clear understanding of why a project is being done, what the fundamental motivation is, what the company is expecting to have solved, realized, what effect or impact they seek, or what opportunities they wish to realize. This is crucial to the extent that, where possible, objectives should be clarified. Having these two ends of the spectrum defined, one can get away with parts of the middle being a bit less visible.

Needs, business requirements, goals, and objectives are not produced or deduced by the analyst. On the contrary, they must be born out of discussions, workshops, fact gathering, and other required activities. There must be a common and shared understanding of these issues and perhaps the best way to achieve it, is by doing it together as a process. If the analyst defines and presents these, this might be good enough. However, the results will not be deeply rooted with the stakeholders. Furthermore, it is through discussions that important facts, details, aspects, and perspectives emerge that increase the probability of doing the right thing and not just doing things right.

Let us discuss objectives a bit further. Objectives are, as we have seen above, connected to the business needs. Remember that during the future state analysis, we don't define the business needs or the business requirements. These are taken as inputs from the current state analysis. It might happen that modifications are made but generally, we should know why we do this initiative long before we start looking at how it can be delivered.

Objectives are supposed to be metric-centric and as such, they can assist in understanding the needs and the business requirements. It is even possible to define preliminary objectives during the current state. As we have said before, the business analysis process is not straightforward, and the results can be produced at different stages. In some cases, it might be helpful to add quantifiable aspects to assist in understanding the business needs. However, these numbers are not final, because as it is a process, changes happen. A company that, at the outset, has expressed their business need to have 99% STP (straight through processing) of a process might have seemed reasonable but as more information is gathered, it might be that the cost of achieving such levels of STP will be unreasonably high. Considering the cost and the value, the company might decide that 95% is good enough level and define the future state accordingly.

Let us revisit the example of dissatisfied customers. This business need might be quantified by looking how many customers register complaints and their ratio of all customers. The analyst together with the stakeholders has perhaps identified these aspects from discussions on the impact of the problem. As mentioned before, these numerical descriptions help understand the business need as they clarify why this is a need and how it hurts the organization. It is also a valuable input for the current state analysis and the target state.

In this case, let us assume that the business need is defined as to improve customer satisfaction. Numbers help us better understand what this means. Simple statements, such as, improved customer satisfaction is open to interpretation. Would one or ten more satisfied customers be enough to achieve the need? As such, it is better to express it in numbers such as the examples listed below:

- Reduce dissatisfied customers who register a complaint by 50% before the end of 20XX.
- Reduce the average delivery time of products by 20% within 6 months.
- Make 90% of all systems compliant with a certain regulation.

The needs should not change during the project. Naturally, new facts or events outside of the project might affect and cause a need to modify aspects of a defined need or the numerical targets. However, once the project starts to actually implement the solution, the need must be clear enough to be stable.

The analyst should assess the potential value of the change for the company. The aim is to get an understanding of how the potential value will be generated and if possible, a sense of the magnitude of the impact. It should be noted that some changes do not provide direct value. This is the case with regulatory issues. However, one can also consider such changes as having value as, if neglected, heavy fines can be imposed, or operations halted. The value generated could be by exploiting external opportunities or new technologies, increased value from sales, markets, products, or reduced costs of operations, support processes, or IT.

13.2 Scope of the Solution Space

Ideally, the future state description captures a situation where problems, opportunities, or constraints identified during the current state analysis are addressed. From one perspective, one could view the future state as a description of the future without any specific solution. It is a description of "what" it will be, without detailed discussions about "how" (solution). At this stage, the scope of the solution clarifies what are the choices to consider when generating alternative solutions that will realize the future state. The question of how future state solutions can be generated does not have a standard answer. It is largely a creative process where the quality of the final result depends on the background knowledge of the analysts (such as industry knowledge), domain knowledge of the involved parties, the quality of the input data, the current state description, the stakeholders' ability to collaborate, and the creativity of the parties involved. Although this is and will remain a creative process, there are some main strategies that are often implemented.

The first is to start from the outset and move towards a future state. Following this strategy means, to begin with the current state and analyze the current problems and try to sketch a future state (requiring minor or major changes) where the issues are non-existent. Another way is to adopt and align to external solutions. If companies find it unreasonable to develop in-house solutions, they seek off-the-shelf solutions. The starting point of this strategy is to look for an existing off-the-shelf solution which is then aligned with the specifics of the company (or the specifics of the company are changed to comply with the standard solution). In this manner, the future state is aligned with what the solution can offer. Finally, one can start with the end in mind. If current information systems are too old or require too much effort to change, if a company is introducing a new product/service, entering a new market, or introducing a new function, they might wish to begin with the end in mind. Such a strategy means that the starting point is what and how they want things to be and based on that understanding, consider what needs to be put in place

to enable that. As such, they begin with the end in mind and move backward to where they are, i.e., the beginning. The primary focus is still to map out the future state. At times, it will be difficult to create water-proof separation between future state and change strategy. Again, analysis is an iterative process. However, when considering the future state, the end results or effects are more important. It should describe what we wish to achieve when all is in place, not how we are to achieve it.

13.3 Constraints

Constraints are simply anything that sets a limitation to the solution. Constraints are aspects that are mandatory and cannot be compromised or changed by the solution. In other words, the solutions need to be of such design that they comply with the constraints. Constraints come in many forms and they are as follows:

- **Budgetary**: Constraints that concern availability of financial resources for the solution. A company might have a restriction on how much financiers are willing to (can) spend on the project. In such cases, the solution development could perhaps be more geared towards analyzing what solution can be delivered within the budget.
- **Time**: Constraints concerning time put a deadline on when certain parts or results must be in place. Companies operating in environments with a high degree of regulations face new regulatory requirements with predefined deadlines. The solution simply needs to be delivered before the deadline. The analysis of such change initiatives focuses on what must be delivered to fulfill all or most of the requirements before the deadline. Such solutions might not be optimal. For instance, consider a new regulation taking effect at a certain date. A company operating in several countries might wish to approach the problem by implementing a common solution in every country, but, due to tight deadlines and other ongoing projects, they might have to choose to implement the changes separately in each country. This is not an optimal solution but given the time constraint, there is no sensible alternative.
- **Technology**: Some cases have technological constraints. Such constrains limit new solutions to be implemented in certain ways. Larger companies might wish to standardize such aspects to reduce costs. To achieve this, policies are introduced that restrict purchase of new software to those written in a certain programming language(s). Another aspect is existing IT infrastructure. A common constraint is that the future state should operate within the existing infrastructure.
- **Resources**: Constraints can also be defined in regard to how the solution is to be maintained once deployed. An SME might not have the resources to maintain larger IT systems while larger ones have the infrastructure to manage such tasks. For the SME, a reasonable constraint would be regarding the resource demands for maintainability of the solution.

- **Rules and Regulations**: In many industries, solutions have to comply with certain rules and regulations and are therefore a constraint.
- **Policies**: An insurance company might have a policy stating that all customers that seek a certain form of complex insurance have to have a certain type of account with the company. Therefore, any solution that includes these kinds of products will have to consider such an account structure. This is a policy that is a constraint on the solution. It might be possible to change the policy, and, in such cases, policy change should be assessed and included in the project. If it is not possible or feasible, it is a constraint.

The above list is far from comprehensive but shows that there are restrictions and constraints that must be taken into consideration. A solution that violates a constraint will most likely not be accepted.

As work progresses with identifying and developing alternative solutions, it is easy to forget about the underlying assumptions that might not have been explicitly stated but matter for the solution to work. As such, it is important to have these assumptions brought to light, so they can be discussed. In some cases, the assumptions might be unrealistic and therefore, need to be modified. In other cases, the assumptions might just not be in place and therefore, need to be planned. Regardless of the situation, it is important for the analyst to know about assumptions that make an alternative solution to work or not. It would be fatal to proceed with a project and at the final stages realize that it would not deliver as much value as expected due to a prerequisite not being in place.

Consider the following example. A local bank has been successfully conducting FX trades (foreign exchange) with small and mid-sized (SME) companies. Their personalized approach and close branch-based customer relationship has proven valuable for customer loyalty. As such, although many customers might get cheaper deals with competing banks, they choose to remain as customers. Not long ago, a new solution was introduced that allowed the customers to trade online with the bank. This online platform called FXOnline allowed for trading different types of FX products. However, the confirmation was still done in an old-fashioned manner. This raised a number of issues. Firstly, customers were increasingly requesting a digital alternative, in particular as competitors already offer such solutions. Secondly, the manual processes are costly and error prone. It is also very time consuming and annoying for the customers when the bank starts chasing unsigned confirmations. In a recent audit, more than 580 unconfirmed trades were found. Due to the great risk this imposes, this must be addressed. Finally, manual processes hamper straight through processing (STP) which is a requirement for volume growth.

The analyst working on this case, has conducted a current state analysis and outlined the process with supporting IT structure. Here, the aim is to introduce online confirmations. As such, the future state will clarify the implementation of a fully digital and online confirmation solution. In the future state, the customers should have access to the confirmations and be able to digitally sign them immediately or very shortly after the trade has been conducted. Furthermore, the solution

is to reduce the cost per signature and enable proper tracking of unsigned confirmations. Finally, the solution is to use the existing IT infrastructure. As can be seen, the future state is more concerned about what will be in place. Furthermore, the constraints "draw the lines" to define the space within which alternative solutions can be generated.

13.4 Roadmap for Digital Transformation

Digital transformation means harnessing digital technologies to rethink all aspects of a business [123]. Digital transformation means infusing digital technologies in all the building blocks of the business model and thereby transforming products, channels and so on. Such transformational core changes will require time, resources, and patience. In addition, digital transformation requires a cultural change that takes a company to a state of mind that embraces challenges, experiments, is open to learning from mistakes (failure), and data driven [124]. In an environment where digital disruptors are rapidly challenging the status quo, digital transformation becomes less an option and more a prerequisite for survival. Digital transformation is not a one-time project, but a journey. If the company is already on the path of digital transformation, the analyst must ensure that each change initiative is in alignment and pushes forward on the transformational journey. If there is no explicit digital transformation strategy, the analyst should explore every avenue for making each change initiative as digital as possible. Such a mindset will not only help future digital transformational plans but also increase the probability of survival of the solution in an increasingly digital business environment.

In moving forward, it is important to assess the current state. Digital maturity assessment can help to analyze the current level of digital competency in various business areas. Digital assessment reveals the digital health of each area and the results can be used to better strategize and plan for taking advantage of available opportunities for internal disruption [125]. There are several assessment frameworks and questionnaires available. Most large consultancy firms and IT system providers such as Oracle [126], Adobe [125], and Microsoft [127] have developed their own versions of a digital assessment framework. Most of these frameworks focus on identifying candidate business areas for digital transformation and how to measure the digital readiness.

Deloitte has [128], through cross-industry collaboration, introduced a digital maturity survey which includes five core dimensions, namely customer, strategy, technology, operations, and organization and culture. These dimensions are further divided to sub-dimensions. For instance, the customer dimension is divided to customer engagement, customer experience, customer insights and behavior, and customer trust and perception. Each sub-dimension is further refined with individual criteria. Each criterion is assessed using specific, survey questions. There is a total of 179 individual criteria, showing that a large number of specific aspects make the overall digital maturity assessment.

Commercial companies offering digital assessment frameworks do so to sell their products or services. For example, Oracle has a quick online questionnaire that results in a product proposal [126]. Consulting firms wish to sell their knowledge, hence the results are presented as a metric such as Digital Acceleration Index by BCG [129] or Digital Quotient by McKinsey [130] showing the general level of digital maturity. The framework of PwC categorizes the companies into digital novices, vertical integrators, horizontal integrators or digital champions [131]. In addition, the consultants can compare the results to industry standards [132] and offer guidelines on how to move forward, which areas need urgent attention, and where there are promising opportunities [129]. Despite the commercial interest of companies, such frameworks can be used by analysts as aid when analyzing digital readiness.

Once the company is aware of its current level of digitalization, a plan can be devised to move forward. There are no uniform recipes for a digital transformation. Every company will have a unique journey depending on aspects such industry, digital maturity, and organizational culture. Digital transformation roadmaps are therefore used as a set of guiding principles that should be adapted to the specific needs and opportunities of the company. Just like the digital maturity assessment, nearly all the major consulting firms have their own version of a digital transformation roadmap. Usually, these roadmaps identify the business areas that could be improved digitally and a high-level sequence of stages that must be passed progressing in the transformation process. These roadmaps, different as they are, share some common themes. These are as follows:

- Customer-centricity
- Data and analytics
- Agility
- Digital capabilities
- Integration of digital technology
- Culture and leadership

The above list of topics should be familiar by now. Customer-centric approach refers to the redesign of the business by improving customer experience. It means removing customer pain points in the processes, increasing the transparency by giving free information, taking advantage of digital channels, and implementing new products and revenue models [133]. Integration of data and analytics is another key topic for digital transformation [134]. Data allow for automating a large part of the business operations and provide decision support. Agile working methods and culture have grown from software development. It means continuous releases of the software that is developed in close collaboration between developers and business people [135]. Continuity and communication make the process transparent and more adaptable to changes. Digital capabilities are the core of digital companies. When a business is transforming from traditional to digital, it is important to acquire needed capabilities. Digital technologies in itself will not make it work. For example, if a company sets up a social media presence, they need to ensure content creation and management. Integration of digital technology to everyday work is

essential to digitalize a business. Most companies have systems in place. Hence, it might be helpful to map the existing technologies and pinpoint missing connections [133]. For instance, a company that use emails to send regular purchase orders or billing data to partners could create connections between their systems and the partners' systems. Finally, culture and leadership play an important role in digital transformation. The pace and rate of adaptation are highly influenced by the organizational culture [136]. If the managers and employees have the right mindset, changes will be less painful, perhaps even exciting. Some defining elements of a digital culture are willingness to take risks, being able to operate in uncertain environments, open to making mistakes and learning from them rather than rely on heavy planning, focus on collaborative effort, and work with reduced levels of hierarchy [136].

The main steps of digital transformation are preparation (setting the plan), execution (implementing various initiatives) and finally, taking advantage of the results by scaling up (see Fig. 13.1). Setting the plan means defining the vision and breaking it down to specific initiatives [137]. During this phase, digital maturity assessment and other tools are used to understand the current state and desired future state. Needless to say, external context analysis is very valuable at this state as is the strong anchoring and support of senior management.

The second step is to execute the plan by starting change initiatives. It is better to begin with most rewarding projects [123, 133]. Successful projects help to establish internal support and immediate benefits will create confidence in the large digital transformation project. Such projects can also help reveal needed capabilities for future initiatives and thereby reduce the risk of project complications. As lacking capabilities are addressed, the digital transformation will speed up and be more efficient [131]. Addressing lacking and strengthening capabilities might mean recruiting new people or training existing ones.

Once the new systems are in place and changes are accepted, the company will see the benefits of digital transformation. The business will be conducted at higher pace, helping to maintain a competitive edge. Revenues will probably grow and capacity for expansion and scaling up improve as digital solutions will enable

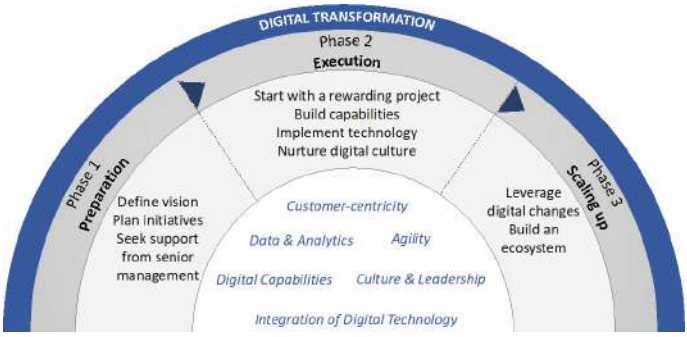

Fig. 13.1 Phases of digital transformation

managing of larger volumes in cost efficient ways. New opportunities for revenue streams emerge as the business can take advantage of benefits from being in an ecosystem [134]. This means opportunity to establish a networked collaboration with other companies to give customers a wider variety of offerings [138].

13.5 Assess Risk

13.5.1 Risk Analysis

No improvement initiative is without risks and one never knows what will happen in the future. Risks are, therefore, about future events that are unknown to us [1, 3]. The main idea behind risk analysis is being aware, prepared and able to manage risks if they materialize. Risk analysis is based on the current understanding, lessons learned, and experiences. It is important to note that risk here refer to the future state. We also considered risks when planning the analysis approach. However, those risks concerned aspects that could impede the analysis work. Here, we look at risks with the future state. That is not the same as risks with project implementations or risks of the solutions. Such risks have their place but not here. Risk assessment for the future state concern unexpected events that might reduce the value of our future state. For instance, in the example of online confirmations discussed above, a risk is that customers do not adopt the new solution. It is a risk that will lessen the value of the solution. One would not be able to say that the user interface will be difficult to understand. That is clearly a risk that the project will manage so it concerns the solution, not the future state. If the solution relies on digital signatures provided by a third party, a risk might be discontinuation of that service. If that would happen, customers would not be able to sign the confirmations. Often, risks analysis focuses on the following aspects:

- Undesirable consequences due to internal or external causes.
- Consequences if those risks materialize.
- Impact of the consequences.
- Probability/likelihood of risks materializing.
- When the risks might occur.
- Signs indicating impending risks.

13.5.2 Risk Analysis Process

The risk analysis follows the steps below:

1. **Identify risks**: risks are discovered or identified by a combination of experiences from experts, past experiences, stakeholders and workshops. The

objective is to identify as many relevant risks as possible as a way to reduce uncertainty and the unknowns.
2. **Assess the consequences of the risk**: for each identified relevant risk, discussions are held as to the consequences of the risk i.e. if the risk materializes, what will be the consequences.
3. **Assess the probability of the risk materializing**: for each risk, assessment is made as to how likely it is to happen on a simple scale of low, medium or high.
4. **Assess the impact of the risk**: the impact of the risk is different from the consequences of the risk. The impact states how it will affect the future state in terms of cost, time, scope, quality and other factors.
5. **Treatment of risk**: the final step is determining how to treat the risks. Some alternatives are as follows:

   – Avoid – measures are taken to remove the source of the risk or to ensure that the risk will not occur.
   – Transfer – some solutions might have risks that can be transferred to a third party or shared with a partner.
   – Mitigate – taking actions that reduce the probability of the risk materializing, taking proactive measures to be able to discern impending risk occurrence and/or find ways to manage the consequences of the risk if they occur.
   – Accept – taking no preventive actions but managing the risk if it occurs.
   – Increase readiness – identifying indicators that can signal impending risks to allow for better preparedness in terms of possible actions to avoid, transfer, or mitigate risks and being able to respond faster.

13.5.3 Risk Analysis Documentation

The risk analysis can be documented using a risk register as shown in the example (see Table 13.1).

Table 13.1 Example of risk analysis

Risk Id	Risk	Consequence	Probability	Impact	Treatment
#1	Risk of customers not using the digital signature to the extent desired	The solution will remain unused which will keep costs and operational risks unchanged	20%	Higher costs (not taking advantage of potential saving of 60% of costs) and higher operational risks	Mitigate – monitor rate of onboarding. If lower than target within first 2 months, plan and execute a marketing effort to increase the ratio

Chapter 14
Change Strategy

By now, the current state, the future state, and the risk analysis have been conducted. As such, there is clarity as to where we are, where we want to be, how we are going to get there, and what risks we foresee. The question we are interested in now is "how do we get there" and "what do we need to do to get there?" Although we have presented these steps in a linear manner, in reality it is not so procedural. The analyst will jump between these steps and work with several of them concurrently. They might find that during the current state analysis, components related to future state, risk, and how to realize the future state are discussed. This is quite natural as stakeholders and analysts think across these stages.

Defining change strategy is essentially about how to reach the future state or in other words, how the future state description can become a current state description [3]. It is, therefore, essentially a question of "changes" that needs to be investigated and described. It is perhaps easy to become focused on the IT changes, but "change" encompasses more than just IT. A good change strategy considers the context, the justification, size, kind of investment, resources required, key stakeholders involved, and how the company will capitalize on the value delivered with the change. So, "change" is more than just IT.

There are always different ways the future state can be made a reality and as part of defining change strategy, the analyst will find, compare, evaluate, and together with the stakeholders, select the best solution. The analyst will carefully consider the gaps existing between the current and the future state, assess the readiness of the company to embrace the changes proposed, and investigate the impact such a change will have on the company. In this process, the analyst will work with defining the final change strategy and its scope. These results, "change strategy" and "solution scope", are the outcomes of defining change strategy. Before we can start designing a change strategy, we need to know what is missing in our current state, or what gaps we have between the current and the future state.

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14.1 Gap Analysis

The current state describes the situation "as it is" while the future state describes how it "is to be". In order to move from the current to the future state, a set of changes needs to be made to fill the gaps. These are gaps between the current and the future state [1, 139]. Identifying, describing and assessing different ways to fill these gaps is "gap analysis". In order to do a gap analysis, we need to know the current state, the future state, the business needs, and the problems. A gap analysis identifies and lists the things preventing the organization from meeting its needs. In other words, a gap analysis identifies what needs to be put in place for the organization to meet its needs. The gap analysis can be structured and listed using a template. There are many different templates and most include a minimum number of aspects:

- **Current state**: A description of the current situation and may also include numerical values.
- **Future state**: A description of the target state. The description may include numerical values as well.
- **Gap description**: A textual description of the identified gap. This description may include the target numbers (reducing dissatisfied customers by 50%) or it may be put in a separate column dedicated to the numerical criteria.
- **Actions**: In this column, the alternative ways to fill the gap are listed.

Note that most templates include a column for "action". One can use this to define what is required to fill the gap without going into solution details. For instance, in the case of online confirmations introduced in the previous chapter, the current state is manual signature. The future state is digital signature. The gap is simply lack of a solution. The action can be "implement a ready (off-the-shelf) mobile signature solution". As can be seen, it does not specify exactly the solution nor the product. It simply notes the gap and what is needed to fill that gap. Some templates capture more information that can be very helpful and greatly assist in understanding the gaps better. The data they capture are as follows:

- **Size estimate**: Assessment of the size of the effort required to fill the gap. The assessment is usually at the level of small, medium or large.
- **Example**: A description of an actual example which illustrates the gap.
- **Responsible unit**: Stating which business unit "owns" the gap.

It was mentioned before that the gaps often occur in different areas such as business processes, organizational units or information systems. Some templates have pre-defined generic areas in which gaps occur during improvement initiatives. These areas are as follows:

- Competencies, skills, and knowledge (training)
- Tools/equipment (including facilities and locations)
- Software, applications, and technology infrastructure
- Alliances, partnerships, and external cooperation

Table 14.1 Example of generic gap analysis template

Area	Current state	Future state	Gap description	Example	Responsible unit	Action	Estimated size
Skills							
Tools/ equipment							
Software							
Alliances							
Processes							
Practice							
Other							

- Business and other processes
- Practice, policies
- Functions, lines of business, organizational structures
- Data and information
- Other

A sample gap analysis template is shown in Table 14.1 and can be adapted depending on the initiative in question. A word of caution. Gap analysis can be made as large as one wants. At some point, as with all other analysis activities, the effort will not be cost-effective. If the gap analysis is very rudimentary, then it will not add any value. It will simply not give enough information or be useful for further work with change strategy. On the other hand, if it is too detailed, much of the information will not be used for finding different alternative solutions. If the results are not used, it is a "waste" of time.

14.2 Alternative Solutions

Ideally, we know by now the gaps. The question is then "how can we fill the gap?" There is usually more than one way. The purpose of alternative solutions is to find the most viable solutions that can fill the gaps. In so doing, the first step is to identify alternative solution options. It is good to find as many potential solutions that meet the needs. One can and perhaps should include alternative solutions that do not fully meet the business needs. Such alternatives can be good enough or sufficiently fill the needs and therefore, can provide a better decision basis. Secondly, it is good to define the assumptions for each alternative. Assumptions are factors that are necessary for the solution but are not yet verified. A solution might only be beneficial if certain assumptions are in place. Failing to uncover them and ensure their implementation, will result in the solution becoming powerless to deliver value. Likewise, constraints are important. When working with improvement, the organization does not have unlimited access to resources and there might

be constraint that cannot be changed by the solution or are obligatory elements that constrains the possible alternatives. The restrictions need to be defined and each solution examined in light of the constraints. It could be budgetary restrictions – a company might not have the funds to embark on a project and therefore has a restriction as to how much the project can cost. Another example is time restrictions – a company might have a deadline to deliver new solutions that comply with new regulations. A final example is technology and infrastructure – a company might have a specific infrastructure or technology that is spread wide and all new solutions need to be "within" the existing infrastructure. Once a number of alternative solutions have been generated, they should be ranked. Hopefully, only a few solutions will emerge as the most viable alternatives. Once a short list is produced, it is vital to gain agreement on the alternative solutions from all key stakeholders. The list will consist of a few possible solutions but before the most suitable one is selected, they must be verified, assessed, compared, and evaluated.

Verification is made from two perspectives. The first is to ensure that the alternatives are aligned with the business needs and the problems. This means that the solution should actually address the needs to a large extent. As previously touched upon, it is possible to include alternatives that does not fully realize the effects sought, but the solutions must still satisfy most of the needs. A final verification to ensure alignment can well be worth the effort.

The second perspective of the verification is to ensure that the solutions do not cause issues or problems in other related parts of the process. Consider the following case of a business process in a unit that has improved by increasing the output by 30% after a successful project. When the expected value of increased sales of 30% does not materialize, a business analyst investigates the matter and the problem is found. The sales department cannot manage the improved productivity as they do not have the capacity to manage the increased volume and therefore, are not selling more products. Likewise, if the same process can improve its output by 30%, it will require more input. However, if the suppliers cannot provide for the increased demand, the business improvement will not result in the desired results. Therefore, it is important to verify that the overall processes, and the company, can digest improvements in certain parts and avoid sub-optimization.

The alternative solution scan be assessed from different perspectives. First of all, any investment made should deliver more value than it costs. However, different alternative solutions will deliver different results. In the same manner, they will cost more to develop and deliver. A cost-benefit analysis (business case analysis) allows for comparing the ratio of benefit versus costs of each alternative and thereby, giving an important input to the comparative assessment of the alternatives. The effectiveness of a solution is not only measured in financial terms. The readiness of the organization to new solutions is also an important parameter to consider. Finally, the risk of the different solutions in regards for instance to complexity is also worth considering.

14.3 Potential Value

The primary motivating reason for the initiative is to deliver value and choose the alternative that fulfills the needs and delivers highest value. One way to compare alternatives is by the net benefit they deliver [140]. The net benefit reflects the net increase the company will gain from the investment. Not all investments yield positive net value. In cases where companies have to invest in order to comply with regulations, there is usually no increase in net value. In such cases, there are other driving forces behind projects. In most cases, however, projects are required to deliver positive net value. However, benefits need not be confined to quantifiable metrics. New partnerships, adaptation of new technologies that will have positive effects beyond the investment and being better equipped to exploit emerging opportunities are also of value.

As the value delivered by the investment is very important, it is necessary to compare the alternative solutions from a financial perspective. Such benefit analysis or financial analysis includes, to the level of detail possible, expected benefits and costs if the change is made as compared to if no change is made. While such calculations will not include all potential opportunities, they allow for understanding and comparing the alternative solutions from a financial perspective. The financial analysis is also a valuable input to the final selection of the solution. As the analysis compares the benefits in relation to the costs (investment required), it allows for more informed decisions. Let us now turn our attention to cost estimation [141, 142], benefit analysis [140], and financial analysis [143]. Bear in mind that the estimations are on a high level and their accuracy is based on the available information at this point and therefore, indicative. As the selected solution is designed in more detail, the numbers for cost estimation will become more accurate. However, the value estimations will not be ascertained before it has been used by the company. Value is oftentimes measured in relation to the costs of producing that value. Such analysis is called "business case analysis" or "cost-benefit analysis". Let us begin with examining the cost side and then the benefits before we do a cost-benefit analysis.

14.3.1 Cost Estimation

The main purpose of cost estimation is to forecast the cost and effort involved in developing and implementing the solution. The cost estimation does not only concern the project costs but also the costs of having the solution in operation. The main costs that are estimated are the following:

- Project costs
  - Hardware
  - Software (licenses)

  - IT development costs
  - Test costs
  - Consultants
- Implementation costs
- Resource costs covering all business people
- Business costs (all costs incurred by the business units for the solution)
  - Training
  - Changes in operations and routines
- Operating costs such as maintenance, support, upgrades and all other costs that are incurred by using the solution.

It is almost impossible to make accurate cost estimations at this point as many variables are unknown as the solution is not detailed. The estimation process is iterative where estimates are reviewed and revised as more information becomes available. The most common way of accounting for such uncertainties is to offer a range as to the accuracy of the estimates. The estimates are therefore expressed within a range of ±50%. The accuracy can also be given with less range such as ±30%. The range will depend on how much information is at hand. However, it is very rare that the accuracy can, at this stage of the process, be more precise than ±25%.

14.3.1.1 Estimation Approaches

There are many different methods for estimating the costs. Some approaches such as agile methods have their own methods for estimating the effort required to develop the system. Some common approaches to estimate costs are as follows:

- **Top-down**: In a top-down approach, the starting point is previous experiences. The approach is to compare the project with a similar project that has been completed. Then the project is estimated by comparing the costs of the completed project. If the project has an interface that is assessed to be 15% larger than that of the completed project, the cost of the interface is adjusted with 15% and taken as an estimate. This approach is useful when the solution is not described in much detail. This approach is fast, less costly but less accurate. Such an approach requires that there are experiences and data from previously completed projects.
- **Bottom-up**: The bottom-up approach assumes that the solution is fairly detailed. In this approach, the cost estimation starts at the lowest level of the solution and all the individual costs estimated are summed up. This method is more accurate but requires that the solution is described in more detail.
- **Rough Order of Magnitude (ROM) Approach**: This approach relies on the skill and experience of those estimating. This method offers a "ballpark" figure with low accuracy. One way is to divide the different parts of the solution into

parts requiring low, medium and high effort. The values (time and cost) for each of these sizes are assessed and multiplied with the number of parts of that size.

- **PERT**: when the PERT (sometimes also called three-point estimation) approach is applied, each component of the solution is given three estimates. The first is the "optimistic value" representing the best-case scenario. The second is "most likely value" and finally the "pessimistic value" representing the worst-case scenario. The weighted average of each component is calculated by taking the (optimistic value plus the pessimistic value plus four*the most likely value) divided by six. The total estimate is the aggregated value of all the weighted values of the components.

Such estimates will not be very accurate and might be in the magnitude of ±50%. The objective is not to have a very accurate estimate but rather a rough understanding of the time and cost. In the later stages, when the solution is to be delivered (project organization), and much more information is available, the accuracy needs to be much higher. The choice of approach will depend on the context, the level of detail of the solutions and how many alternatives are being compared. If there are many alternatives it is better to choose an estimation method that is fast, but if only one solution is required, it is perhaps more preferable to apply a method with higher accuracy. When estimating costs, it is possible to combine or use two different methods. Regardless of methods used, it is highly valuable to use experiences from previous projects. Oftentimes several improvement projects have been done on the same processes and information systems. The lessons learned, the cost estimates made, and the actual costs of the previous projects can assist in estimating costs for the current alternative solutions or used to assess the reasonability of the made cost estimates.

14.3.2 Benefit Analysis

Improvements are made for the sole purpose of delivering added value to the organization. The benefits of the investment need to be estimated in order to assess if the benefit created outweighs the costs of delivering them. The benefits contribute to higher profits by either (1) increasing revenues or (2) reducing costs. At the end of the day, these are the only ways profit is increased (net value is added). Let us take a look at some examples of how profit is increased as a result of change initiatives:

- Increased revenues
  - Offering new or improving existing products/services will attract new customers and increase revenues.
  - Entering new markets to sell products/services.

  - Gain qualitative benefits that indirectly improve the revenues, such as, a better brand name and easily recognizable, increased customer satisfaction, the workplace and improvements that attract highly qualified staff.

- Reduced costs
  - Reduce operating costs by increased productivity by replacing manual tasks with an automated solution, thus reducing inventory, personnel costs or scrap.
  - Reduce IT costs by decommissioning legacy systems, consolidate IT systems or reduce the maintenance costs.

The structure of benefits through increased revenues and reduced costs can be captured as a benefit tree (see Fig. 14.1).

The starting point is "improved benefit." To achieve this, increased revenues are required and to achieve improved revenues, more satisfied customers are required. The structure shows that items listed to the right of the box represent what is required to achieve. Note that "improved benefit" can be substituted with any other benefit. These benefits are directly related to the problem and should reflect the results of the problem analysis. If the current state identified the problem with customer dissatisfaction and the desire to reduce it by 50%, it should be represented in the decision tree structure in Fig. 14.1.

The next step is to capture how much value is created. During the problem statement and definition of the target state, the effects of the improvement are

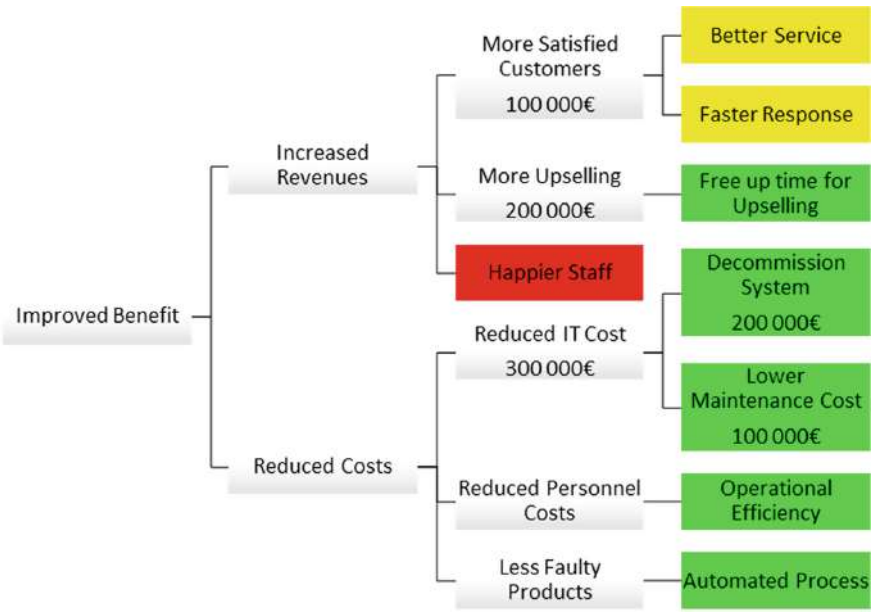

Fig. 14.1 Benefit tree

estimated in terms of numbers. The benefits are to be incorporated in the above benefit creation structure. If customer dissatisfaction was reduced by 50%, it was estimated to increase the revenues by €100,000 and therefore added to the benefit structure as shown in the above.

The boxes on the far right are colored red, yellow and green. The color depicts what type of benefit it is (based on PENG analysis [144, 145]):

- **Green**: represents benefits that directly contribute to the increased benefit. For instance, reduced IT costs will directly add value to the company. These benefits are easily estimated based on existing data.
- **Yellow**: represents benefits that indirectly contribute to the increased benefit. Improved customer service will indirectly add value as it is assumed that with better service, more customers will buy the product or word of mouth will attract new customers. These benefits, while possible to assess, are based on "guestimates" and difficult to follow up.
- **Red**: represents benefits that are very hard to quantify because they are qualitative benefits. Happier staff would be an example of added value, but it is very difficult to estimate by how much. These are not always noticeable in the short term and it is difficult to clearly link benefits with a specific cause.

Another way to categorize the "color" of the benefit is by assessing the probability of them being realized. Benefits that are certain to be realized within 1 year, such as, a reduction of staff, or costs, are marked green. Those probable but might require up to two years to be realized such as, increased sales through better customer satisfaction, are marked yellow. Finally, benefits that are uncertain and require longer than two years to take effect, such as a better company image are marked red. Commonly, investments are not based on "yellow" and "red" benefits.

The benefits of each color are then summarized and presented as a column (see Fig. 14.2). The analysis gives an overview of the potential benefit of the project in

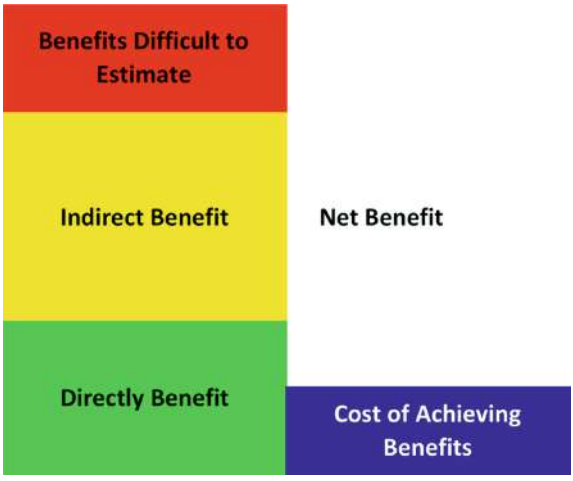

Fig. 14.2 Example of cost-benefit analysis

relation to the costs of delivering the value. The benefits marked green are the most valuable, as they will bring direct benefit/profit to the organization. We can clearly see that a solution is of higher value if the green area exceeds the blue area (costs). Such a situation means that the direct benefits outweigh the costs of realizing such benefits. However, if the solution delivers higher value, but the blue area is at the top of the yellow or equal to the red area, it is much more uncertain. Such cases mean that the solution could deliver value exceeding its costs but indirectly, or in ways that are hard to measure. This kind of analysis is also called "PENG – analysis."

14.4 Business Case Analysis

The analysis presented above does not give enough information to compare different alternative solutions in an objective manner. Therefore, we can turn to business case analysis. This analysis serves mainly to gain an understanding of the relation between costs and benefits of a solution considering the initial costs of investment, and the annual costs to use and support the solution within a defined time frame. The analysis results in a set of metrics that can be used to compare and assess different alternative solutions against each other. It is better to apply a set of different metrics to the analysis as each metric has its strengths and weaknesses. The combination of several metrics will give a better overview of the financial aspects of the solution. The most commonly used are NPV (net present value), IRR (internal rate of return), ROI (return on investment), and payback period.

The business case analysis compares the benefits of a solution to the costs required to realize that gain. It starts with defining a set of numbers. These are as follows:

1. Investment costs covering all project costs, IT costs and costs for resources to implement the solution (including licenses, price of products).
2. Costs of maintaining or supporting the solution and all other costs that are incurred when the solution is in operation.
3. The time frame of the investment. Some companies have a policy that investments should be calculated on the basis of three years after it has been implemented. However, the nature of the investment, its size, its strategic importance and other factors affect the time frame to be used. A pharmaceutical company developing a new drug would have a longer time frame, whereas, an IT-intensive investment time frame would be much less. In short, definition of the time frame will depend on what type of investment is being analyzed.

Once the above parameters are defined and agreed upon, the cost-benefit structure can be set up. The benefits are set up first followed by the costs for as many years as the time frame states (see Table 14.2). The values are entered for each year they are expected to occur.

Table 14.2 Cost-benefit analysis

	Initial/Year 0	Year 1	Year 2	Year 3
Expected benefits				
Increased revenues		100	150	150
Reduced operating costs		50	50	50
Time savings		50	50	50
Reduced cost of errors		50	50	50
Reduced IT costs		150	100	100
Other costs		50	50	50
Total annual benefits		**450**	**450**	**450**
Costs				
Project costs	500			
Licenses	100			
Marketing	50			
Ongoing costs		50	50	50
Other costs		50	50	50
Total costs	**650**	**100**	**100**	**100**
Net benefit	−650	350	350	350
Accumulated net benefits	**−650**	**−300**	**50**	**400**

The expected benefits and costs have to be properly calculated using as much available data as possible. The cost-benefit analysis will only be as good as its input data. If this data is too optimistic or based on unsupported facts, the financial analysis will reflect this. Year 0 or the initial year stands for the year in which the project will start. The net cash flow (cash inflows minus cash outflows) is calculated for each year. The net benefit (cash flow) shows how much added or extra value is created by the solution per year. In year 0 there was only investments of 650 and therefore the net benefit is −650. However, by year 1 some benefits were gained (450) but the costs were 100 and therefore the net benefit is 350. Note that this is the net benefit for each year. The accumulated net benefit shows the net effect over the years. In year 1, the accumulated benefit is −300 meaning that for year 0 and 1, the solution has had costs of 300 more than the benefits. The accumulated benefit becomes positive (50) in year 2. This means that during year 2 the costs of the investment would have all been covered by the benefits.

Different solutions will realize different benefits and costs over the different years within the time frame. As time affects the value of money, these different values have to be calculated in terms of their present-day value for making them comparable. A benefit of €200 realized in year 1 does not have the same value as the same benefit realized in year 3. In order to make the different alternatives comparable, their present-day value needs to be calculated. The present value (PV) is calculated by dividing the future value (FV), which is the net benefit of the investment of a specific year, with the rate to the power of that year. The formula is PV = FV/(1 + r) n. In the example in Table 14.2 the net benefit of year 3 is 350.

The future value is therefore 350 and the number of years is 3. Let us assume the rate is 10%. The present value is therefore PV = $350/(1 + 0.10)^3$ which is about 262. This is only the present value of year 3. However, there are several other years plus the initial investment costs. Net present value incorporates all the present values and the initial investment. The net present value for the above example is therefore calculated in the following way. NPV = investment costs of year 0 + the sum of all present values for all the years. A more formal definition is NPV = Initial investment + $\sum${Net Period Cash Flow/(1 + r) n}.

In the example above, we assumed a discount rate of 10%. However, in reality, this rate is not chosen arbitrarily. Many companies have a standard policy of which discount rate to use. The discount rate represents the rate at which the company can get returns on investments. In other words, if the company has a discount rate of 15%, they would receive a return of 15% if they invested in another project. Another way to determine the rate of return is to consider the cost of capital. Every company is funded by taking bank loans and/or other lenders and/or funding from shareholders. The part of the company that is funded by bank loans or other lenders (via corporate bonds) has a fixed interest rate. This interest rate is the cost of lending that money. Shareholders have also "loaned" money to the company by buying the stocks. Shareholders traditionally expect a higher rate of return than banks do. The weighted average of these loans is the amount of capital of a company. Let us assume that a company has to pay 15% for the money that finances its business. If a company wants to invest in a project, the project has to be profitable (positive NPV) with a discount rate of 15%. If it is less than 15% the company is using the money that is costing them 15% to invest in projects that return less than 15%. This means they will lose money. However, if the project is profitable at a rate of 15%, the company is using the money at a cost of 15% to generate a higher return. The discount rate, therefore, determines at which rate the investment must return a positive net benefit. An NPV above 0 at the rate of the discount rate means that the investment will, at this rate, generate more benefits than costs during the time frame of the analysis. The higher the NPV, the more net benefit is generated by the project.

The internal rate of return gives the rate at which the investment breaks even i.e. the NPV is equal to 0. In other words, IRR stands for the "discount rate" at which the investment will have an NPV of 0. Some organizations have a hurdle rate i.e. an internal policy stating that projects should have an IRR above a certain threshold. IRR can also be seen as an approximation of risk sensitivity. If an investment has a high IRR, there is more "room" for changes in the numbers before the NPV becomes 0. For instance, an investment has an IRR of 60%. If the numbers used to calculate the NPV change (such as costs are higher, or benefits are less than expected), there is more "room" before the NPV becomes 0 if the IRR is high. In this case, there is more "room" for unexpected events and miscalculations for the project with an IRR of 60%. If the IRR had been 20%, small changes in the net cash flows will put the investment at risk of having a negative NPV. Low IRR leaves very little "room" for errors in the estimates before the NPV becomes 0. In the following formula the IRR is calculated by setting the NPV at 0. NPV = $\sum$ {Period

Cash Flow/(1 + IRR) n} − Initial Investment. It is quite complex to calculate the IRR manually but applications such as Excel and Google Sheets have predefined functions for IRR calculations.

NPV calculation returns the total net benefit of a project given a discount rate. IRR, on the other hand, gives an estimate of how much "room" we have before the NPV becomes 0. However, these metrics do not state how much benefit is generated in relation to the costs of the investment. Return on investment is often used to give an understanding of the relation between costs and investments. ROI is calculated by taking the "total gain of an investment" minus "the cost of the investment" divided by the "cost of the investment." As such it returns a percentage that shows how many times an investment gives a return on an investment. For instance, a person buys shares in a company for €5,000 and sells them the next year for €7,000. The ROI is calculated by taking the total benefit (€7000) minus the cost of the investment (€5000) divided by the cost of the investment (€5000), which returns an ROI of 40%.

Payback period refers to the time it takes for an investment to recoup its costs. Payback period only concerns itself with the time it will take to regain all the costs of the investment. If a company invests 1 million in a project and receives 0.5 million in net gain per year for five years, the total benefit will be 2.5 million. However, the payback period is just above two years because after two years the costs of investments are covered by the net benefits. In the example shown previously, the payback occurs in year 2. As can be seen from the accumulative net benefits, sometime in year 2 the benefits have outweighed the costs.

14.5 The Example of Personalized Mutual Funds

Mutual funds used to be a little-known financial instrument, but in the past 30 years it has become a part of many people's daily life. Some people choose mutual funds to invest their money, others save a little every month, and many more have their pensions invested in mutual funds. Recently, people have realized that the fund managers take substantial fees for "actively" managing the fund. However, they under perform in the market leaving many to be skeptical about the value they deliver.

A company selling traditional mutual funds, decided to add "personalized mutual funds" as part of their offer. Instead of going to the bank and buying shares or parts of one of their existing mutual funds, I can create my own mutual fund based and adapted to my own specific needs, risk preference and time horizon. How cool would that be? The idea would be for a customer to enter the web-site, register and enter their preferences of how much to invest, if they want to save on a monthly basis and how much, how long the time horizon is, what kind of risk preference they have, what kind of markets they like to be in, if they like stocks with high dividends, and similar questions. Based on the preferences, the algorithm makes

suggestions on stocks, ETFs, or indexes and how many of each to buy. The customer can then edit or accept.

The algorithm will sort out and put together a diversified portfolio of stocks that consists of good companies. The algorithm will be mathematical and researched and take into consideration the metrics of companies such as price per earning, dividends and so on. The customers don't need to know the details behind it but just the recommendations. The next step is to buy the stocks. The customer gets the recommendations and then they use their own bank or trading platform to buy/sell the stock. Assume they get about 100,000 customers the first year of operation (year 2). The average revenue per customer and year is estimated to €6. This revenue stream grows at a rate of 35% per year.

As they will refer customers to trading platforms, they estimate that they will get a commission of €0.5 per share. A customer trades on average 5 shares twice a year. The cost of revenue is 28% (for both revenue types). Plus, they need to hire people. The cost per person is €60,000 per year. Initially there will be 4 people (year 1). As they grow, they will most likely have to hire more people causing an increase of the staff costs by 40% per year. To get the solution in place, they need to invest €100, 000 in business development (€60,000 as upfront and the rest in year 1), hire consultants for €110,000 of which, €50,000 is upfront. They also need to do testing which will cost €120,000 of which €50,000 is upfront. In addition to these initial investments, they will need maintenance estimated at €40,000 for the year 2. This cost will grow by 10% as functionality is added. If we look at an investment horizon of 5 years (excluding the initial year) and a rate of return of 18%, will the project be financially viable? The product will go live in year 2. What are the NPV, IRR, and ROI? Which year will the payback occur?

In order to calculate the NPV, IRR, ROI, and the payback period, we need to set up the numbers. The first step is to collect all the relevant information that has an effect on the financial calculations. Let us first begin with identifying the revenues (see Table 14.3).

Once the revenues are identified, let us examine the costs directly related to the generation of the revenues (see Table 14.4).

At this point, we have identified all the revenue streams and the costs for generating these revenues. Let us now turn to costs related to the development of the system (see Table 14.5).

Table 14.3 Revenues

Factors influencing revenues	Size of influence
The revenue from subscriptions once the solution is deployed (year 2)	600,000
The revenue growth per year	35%
Revenues from commissions – this amount is calculated with the assumption of 100,000 customers trading on average 2 times, each time consisting of on average 5 shares, and each share has a commission of EUR 0.5 (100,000 * 5 * 2 * 0.5)	500,000

Table 14.4 Operating costs

Factors influencing operating costs	Size of influence
Operating costs (cost of revenues)	28%

Table 14.5 IT Costs

Factors influencing operating costs	Size of influence
Business development (divided into 60,000 in year 0 and 40,000 in year 1)	100,000
Consultants (divided into 50,000 in year 0 and 60,000 in year 1)	110,000
Testing (divided into 50,000 in year 0 and 70,000 in year 1)	120,000
Maintenance of system	40,000
Increase of maintenance costs per year	10%

Table 14.6 Financial analysis

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Revenues			600,000	810,000	1,093,500	1,476,225
Commission on fees			500,000	675,000	911,250	1,230,188
Total revenue			1,100,000	1,485,000	2,004,750	2,706,413
Cost of revenues			308,000	415,800	561,330	757,769
Profit			792,000	1,069,200	1,443,420	1,948,617
Business development	60,000	40,000				
Consultants	50,000	60,000				
Testing	50,000	70,000				
Maintenance			40,000	44,000	48,400	53,240
Total investment cost	160,000	170,000	40,000	44,000	48,400	53,240
Cash flow invest	−160,000	−170,000	752,000	1,025,200	1,395,020	1,895,377
Pay back	−160,000	−330,000	422,000	1,447,200	2,842,220	4,737,597

At this stage, all the revenues and costs are listed. The next step is to structure the numbers per year as discussed previously (see Table 14.6).

Once the numbers have been structured according to Table 14.6, we can start calculating the revenues, costs, and profit. We can see that the revenues will begin in year 2 and increase by 35% per year. Furthermore, we see that the generation of revenue incurs costs that are also captured in Table 14.6. Finally, the costs of the development of the system are listed according to the year when they are estimated to occur. As can be seen from the calculations, the cash flow of the investment begins with negative numbers in year 0 and 1, but when the solution is implemented (year 2) and revenues are generated, it becomes positive.

As we discussed earlier, the present value of future cash flows is made easier if we discount one cash flow rather than incoming and outgoing cash flows. Rather than calculate the present value of revenues for year 3 and then subtract the present value of total costs of the same year, we simply calculate the net cash flow for year 3 which is 752,000. Furthermore, we need to know how many years, in this case 3, and the discount rate (18%). If all the cash flows are converted to their present value, we get the net present value (NPV) by adding them together. Naturally, the initial and the first year will return a negative present value but from year 2, in this case the present value will be positive. The NPV is easily calculated by using the NPV function of Excel or Google Sheets. If the NPV is calculated manually, it is done in the following way. For each year, calculate the present value where the cash flow is discounted according to the following formula: PV = (net cash flow)/((1 + discount rate) ^ year)

The sum of all present values is the net present value. As can be seen from Fig. 14.3, the present value of the cash flow of year 0 is unchanged as it is "now." However, the value of the cash flow, beginning from year 1 is less today.

The IRR is more complicated to calculate manually and therefore, better left to Excel or Google Sheets. These spreadsheets have built-in functionality for calculating the IRR. For the IRR, we take the same set of numbers, the net cash flow per year. As the IRR is the discount rate at which the NPV is equal to zero, it is possible to incrementally change the discount rate until the NPV becomes zero. In this case, if the net cash flows are entered in and the IRR calculated, it will give 156%.

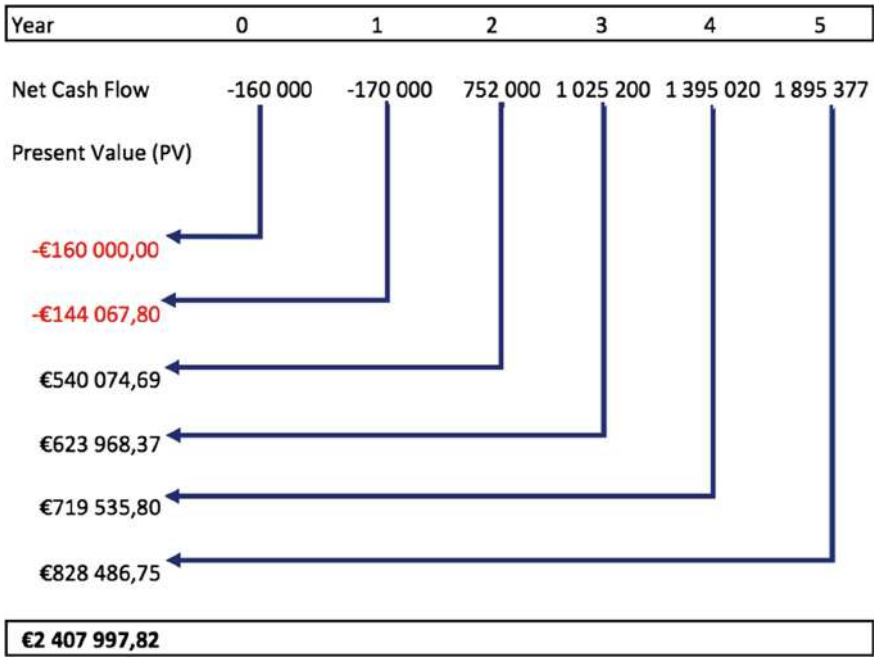

Fig. 14.3 Calculation of net present value

The payback is easier to calculate. The payback is simply the accumulated net cash flow. As can be seen from the numbers, at the end of year 0, the cash outflow is €160,000. Likewise, in year 1, there is a cash outflow of €170,000. This takes the accumulated cash outflow to €330,000 in year 2, on the other hand, there is a cash inflow and the net cash flow is €752,000. The accumulated cash flow is therefore €422,000 (−330,000 + 752,000). As such, by year 2, we have received the money we spent. In conclusion, the payback time is in year 2.

The ROI is also simple to calculate and shows the ratio of return on the investment. The formula is accordingly: ROI = (total benefits − total costs)/total costs. In this case, the total benefits are the accumulated revenues for all the years of the investment period (sum of total revenue) which is €5,253,237. The total costs required to generate this revenue is the sum of all costs, in this case €515,640. According to the ROI formula, this will give an ROI of 919%.

14.6 Total Cost of Ownership (TCO)

A solution not only incurs costs during its development but has direct and indirect costs. The total cost of ownership [146] is the long term price covering all costs of owning the solution. The TCO of a car is not only its price but also all expenses associated with owning a car, such as insurance, tax, repairs, fuel, and service costs. The car might have a very attractive price but end up being costly to own. A used car might be cheaper to buy, but will require numerous repairs; while a new car is more expensive it will come with a five-year warranty.

The TCO allows comparing solutions over a specific time period based on all costs that might occur. A company that decides to buy software and install it in-house, will consider the cost of hardware, service, maintenance, development, upgrades and staff for managing all such activities in its total cost of ownership. Another alternative might be to buy a comparable software as SaaS (Software as a Service) where costs for hardware, installation, upgrading, maintenance are not required as it is managed by the company. The price of software for in-house installation might be cheaper but the TCO might be higher over a period of five years. However, the SaaS solution might be cheaper from a TCO perspective for a limited number of users (if SaaS solution is priced per user). A company might have planned to expand the usage of the system within the company (more users). Depending on the number of users, the in-house solution might be better from a TCO perspective.

14.7 Readiness for New Solution

Another parameter to consider is the feasibility of the alternative solutions. In other words, the analyst needs to consider if the alternative solutions are effective in the context of the organization. One option might be very high-tech but could cause

difficulties for the organization in terms of readiness adopting new technology. A very good solution on paper might not work in all settings. It could also be that organizations are not ready to adopt a new solution, but management is determined to go forward. In such cases, incremental development or implementations are perhaps considered. Another important aspect is how the transition will take place. At this stage of analysis, the alternative solutions are assessed in terms of how feasible it will be to implement the solution in its context. The analyst is considering the readiness of the organization to adopt the proposed solutions. A few aspects worth considering in analyzing the readiness are as follows:

- The impact of the solution to the current state (processes, systems, stakeholders etc.).
- The current architecture and implementation of the solution in the existing architecture or changes required for implementation.
- The transitions required for the solution – implementation of new solutions and making the stakeholders comfortable with them.

The main issue at this stage is not to make a detailed plan or in-depth analysis of which solutions will be received better. It is rather to add the perspective of context to the evaluation. A low readiness for a specific solution does not necessarily mean it is discarded but does bring to light additional aspects that need to be considered. The readiness analysis serves to highlight the aspect of the migration from current to the target state of an organization. One way to analyze readiness is to use POPIT.

The POPIT model [139] provides a framework for assessing four main areas to consider when introducing changes. When conducting analysis work, the focus is intensively on processes and information systems. It is important to use a holistic method to capture all aspects of change in an organization. Otherwise, there is a risk of becoming too narrowly focused on the technical aspects of the change. POPIT stands for process, organization, people, information, and technology. POPIT (see Fig. 14.4) is a technique used for identifying the elements that need to be considered when working with business process changes. The aspects that the POPIT model considers are as follows. The first P stands for people and refer to the persons who carry out the work, their skills, competencies, job designs and the culture of the organization. The O stands for organization which covers the business model, organizational structure, management structure, roles, and responsibilities. The second P refer to business processes the organization uses to create value in the form of products and services for customers (value chain s or value streams). It also covers the support and management processes enabling the core processes to work. The IT represent the Information and Technology which encompasses all the hardware and software used to support the work of the organization.

A business analyst works to improve the business processes of an organization. The improvements identified will affect the organization, people, information and technology of the company. With the POPIT model, the changes are assessed and analyzed to see what is required from the organization, people, information and technology to realize the change. The POPIT model can assist in identifying gaps in

Fig. 14.4 The POPIT model

areas that are not easily noticed with the current and target state analysis. Consider implementation of a new process in one of the business units of a company. The data and information systems might need to be adapted. The people who will be working with this process and perhaps even those working with adjacent processes will be affected. The staff might require training, new skill sets might be required, and additional staff need to be recruited. The organizational structure might require changes where some responsibilities are moved from one business unit to another or a new subdivision needs to be created. At the core of the POPIT analysis is considering how changes to one of the triangles affects other aspects of the company and what they are required to do for the change to be effective.

14.8 Implementation Strategy

It is worth considering how it will be implemented. The project organization is responsible for the actual delivery of the solution. However, here we consider overall strategy or a road map at a high level. We consider a rough outline of key events and activities that will enable the company to go from current to its future state. It is a road map of what is required to implement a change that will satisfy the needs, solve the problems or capitalize on identified opportunities. Simply put, how do we want to go from the current to the future state? Do we wish to take a "big bang" approach, meaning that all the required changes are included in one project? We could also take an approach of gradual implementation of concurrent or sequential set of projects that collectively will lead to the future state. The steps or the way to the future state will need to be determined based on many parameters. If the change required is very large, perhaps decomposing it to manageable projects is a better strategy. In such a way, smaller values can be realized, and the projects will be more limited in their size and complexity. However, if it is done as a "big bang"

the value will not be realized until the end of the project which could be years ahead. On the other hand, decomposing a large change into smaller projects, each of which does not add value or cannot be used until all parts are in place, might not be the best strategy.

Consider a company that is intent on improving its approach to customer relations. As part of their future state they have identified the need to implement CRM, a system not previously used in their current state. Such a system can be implemented in one "big bang" manner, or to ensure that all things are working properly it can be implemented first into their smallest (or least profitable) customer segment. Once bugs and similar issues have been resolved, they can expand its use to bigger (or more profitable) customer segments. Furthermore, the company might want to integrate their CRM system with their digital marketing strategies where they connect paid and earned media with leads, quotes, existing customers, and how they can upsell the customers. In the light of this it might be more suitable to implement the final solution incrementally, rather than in one big deployment. On the other hand, if the company is small and the customer base is manageable, perhaps it would be better to deploy the solution in one go rather than prolong the process.

For larger projects, it is common for companies to opt for a transitional change rather than make a single change. There are many factors, including the available budget, urgency and deadlines, time or resource constraints, the ability of the company to accept and absorb the changes that affect such decisions. The business analyst plays an important role guiding and helping to facilitate such decisions that concern release planning discussions. The analyst does not only help in such decisions but also makes sure the stakeholders understand the consequences and impacts of different choices.

Another perspective on the issue is the actual alternative solution. It is not always easy to separate the solution from the future state. However, the future state is more stable in the sense that the results are achievable. How those results are achieved is more flexible. There might be several main solutions, or within one main solution, there might be several options. Let us return to the example above of a company needing a CRM solution. The alternatives before them might be to build their own CRM system adapted to their specific needs, buy an off-the-shelf system and install it on site, or choose a SaaS CRM system. Each of these alternatives will have their advantages and disadvantages. Furthermore, each of these alternatives will differ in the degree they fulfill the business objectives of the company. It is important to be reminded of this and produce relevant results from previous steps. Some of these results are as follows:

- The readiness of the organization for new solutions.
- The major costs required for the investment, the benefits, and the cost to benefit ratio.
- How ("big bang" or transitional strategy) and when (high level timeline) the changes can be implemented.
- When the intended value can be realized.

- Alternative costs of the change implementation i.e., consequences and effects if the change is not done, or of the investment if it is in competition with another investment option. If two projects are available but there are time, financial, or resource restrictions, the project delivering most value is often chosen. Understanding what a company will lose if selecting one project over the other, is important for decision taking. This would be the alternative cost.
- Alignment with the business objectives i.e., ensuring that investing in this change will lead to satisfying the needs, resolve the problems and issues, or enable capitalization of identified opportunities.

As we mentioned before, the business analyst will most likely return to previous results and if needed, modify them. As such, the change strategy might be confusing where many previous results are revisited and discussed. This is part of the process to find the best alternative based on the available information.

14.8.1 Solution Scope

Previously we discussed scoping (scope modeling) of the problem area. We have also discussed this matter during current and future state analysis. However, at the earlier stages of the business analysis process the scope was drawn up with rough lines which are quite normal. The scope is not to be tightly defined early on but rather, it evolves as new facts are elicited, additional perspectives are considered, the matter more closely analyzed, and understanding increases. A good solution scope describes in enough detail what parts, capabilities, aspects will be added, removed, modified, and/or created by the solution. The scope has to clarify how the solution will meet the business requirements and enable the realization of the future state. Furthermore, a good scope captures the mentioned aspects in such a way that all stakeholders understand what the solution will do. The solution scope can be described in different ways. We have discussed the tool "scope modeling" which can be used. Which aspects to include in a solution scope vary depending on the context of the solution but might include some of the following aspects:

- Functions, organizational structures, departmental changes
- Technology, software, data
- Business processes, business rules, business logic, workflows
- Resources, locations, facilities, equipment
- Knowledge, skills, competencies
- Products, markets, customer segments, business models

Once the scope is defined and there is both agreement and clarity among stakeholders about the alternatives, it is time to take the final decision on which solution to implement.

14.8.2 Selecting a Solution

The analyst cannot continue operating with several solution alternatives. It is simply too time consuming to investigate and analyze more than one alternative. Up to now, the analysis has been on a fairly high level. There has not been any deep elicitation of requirements, nor has the analyst spent time on modelling various aspects in details. Perhaps the level of detail has been greater for key or critical areas of the problem area but no more than that. This comes later when one solution has been chosen. So far, the analyst has been assisting in finding a few good alternative solutions, understanding them better in order to choose the right one. At this stage, there is enough data and understanding to make a decision.

The decision to be taken will depend on a variety of factors, data, parameters, and discussions. The final decision may have been evolving alongside all the analysis and perhaps the solution has emerged and there is quite a broad consensus about which solution to pursue. It is also possible that the decision has implicitly been taken as most of the focus has been spent on one alternative, and the other alternative solutions have only been discussed briefly.

Once the analysis is concluded, the final solution can be chosen. The final decision will depend on a myriad of parameters such as key financial analysis, stakeholders, risk and risk willingness, constraints, budgetary issues, importance of the improvement imitative or politics. In this process, the analyst might have to revise some of the results when alternative solutions are modified. Such modifications normally concern minor aspects as at this stage the major aspects have been thoroughly investigated.

It is of utmost importance that all stakeholders are in agreement and support the selected final solution. It is also important for the analyst to ensure the stakeholders understand what the solution is, what impact it will deliver, what it will not deliver, what the stakeholders will gain, what aspects of the stakeholders' operation will be affected, and what will be expected of them.

14.8.3 Feasibility Study (Business Requirement Document)

Having reached this stage, the analyst has generated a considerable amount of information which is not only crucial for the implementation of the solution, but very valuable for future analysis work. As such, it must be documented in a structured manner. The company will take a decision to move forward with the changes proposed by setting up a more formal project led by a project manager. Within the scope of the project, requirements will be elicited, and the solution detailed.

Such a document is referred to as a feasibility study or a form of "business requirement document." Regardless of its name, it is a document that summarizes (and has as appendixes) the work done so far. As the knowledge generated is of

utmost importance, the main purpose of the document should be to capture the results in a way that it can be re-used. This applies to the project that will continue the work and for future analysis work. There are no standards on how and what such documents should include but below are suggestions on topics that could be included:

1. Executive summary
2. Recommendation
3. Background, scope, and delimitations
4. Current State
   - Stakeholder analysisStakeholder analysis
   - Business process models
   - Information system map (data flows, interfaces, and functionalities)
5. Business needs and problem analysis
6. Future State
7. Alternative solutions
8. Costs and benefits
   - Cost estimationCost estimation
   - Benefit analysisBenefit analysis
   - Financial analysis
   - Risk analysisRisk analysis
   - ReadinessOrganizational readiness analysis
9. Selected alternative (including motivation)
10. Results from validation of requirements

A feasibility study might also cover the main inputs for the project as well. If included, it usually includes the following other aspects:

- Dependencies
- Stakeholders affected (and how)
- Critical factors
- Gained approvals
- Delivery (such as in how many increments)
- Roles (project) and reserved resources
- Priority

These aspects refer more specifically to the project organization or the delivery of the solution. Note that during the work so far, all the above results have been examined and analyzed for the solution. In this part, the same results are re-used but the perspective is no longer for the solution but for the specific project that will deliver the solution.

Dependencies state the links to other projects, initiatives or deliverables that the project depends on. A stakeholder affected lists all the stakeholders that need to be interacted with during the project such as the stakeholder matrix previously

presented. Critical factors list the risk that can affect the project and how they can be mitigated. Gained approval is where all involved departments and managers have given their approval and support to the project. Delivery considers how the project is to be organized in terms of delivering the solution such as in one go or in increments. Roles define the resources and their roles in the project.

Finally, priority determines if the cost, quality or time aspect of the project is the primary priority. Projects have a devil's triangle consisting of time, cost and quality. For instance, the project cost can be reduced and the speed (time) of the project can be increased to deliver the results earlier. However, such decisions will affect the functionalities that will be included (quality). The priority will affect the decisions taken in the project. If a project has time as its main priority and a senior developer falls ill, he or she needs to be replaced. If time is of the essence, a senior developer from a consultancy firm can be hired (same quality but higher cost). If cost is the main priority, perhaps a junior developer can step in (longer time but less costly). The priority is set in consultation with the business analyst and the key stakeholders of which the sponsors have more weight in the decision.

Chapter 15
Design Solution

The business analysis process has taken us from an understanding of the business context, analyzing the needs, defining the current state, capturing the outline of the future state, identifying and evaluating alternative solutions, and finally, selecting the main path forward (main solution). The solution is described, on a general level, where the main features are captured in various documents and models. Some might move into a project organization (deliver solution) at this point, others want a more detailed solution before taking the final decision on initiating a project, and some take decisions successively by deciding at each step, if to move forward with the next step, to cancel, or to re-do some work. Furthermore, the project approaches the company uses, also has an effect on this matter. Agile methods move into a project organization sooner as compared to companies following predictive approaches. Regardless, the solution is not defined in enough detail for coding. There are several possible ways the solution can, which have not been clarified. As such, the solution is simply not ready, it should to be refined, requirements analyzed, and the design must be set.

The distinction between requirement and design should be clarified. In the beginning phases of the analysis work, we focus on the business needs at a high level. As the work progresses, these needs are refined and expressed in more detail by being decomposed into "sub-needs" or several needs that together make up the main need. Note that once the needs or problems have been defined (assuming it is the "right" one), they do not change as the analysis process progresses. However, the understanding of how needs can be satisfied, or the problem be solved increases. As the analyst describes the ways the needs will be satisfied, or the problems are to be solved, the descriptions become requirements. The different ways the business requirements can be fulfilled are design options. With this in view, IT might consider every input given to them as requirements. Different organizations use different terms and it is important that the analyst is clear about what word refers to what concepts. The interplay between requirement and design is applicable at different levels but is named differently.

F. Milani, *Digital Business Analysis*,
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Requirement elicitation [147] is an area that has been extensively researched. Many theories, methods, approaches, principles, and guidelines have been provided by industry and academia. Commercial programs have also been developed to support requirement elicitation and management. Although we see many varieties of methods and tools, they share a common core of concepts and ideas. These commonalties are more or less the underlying foundation of most methods. While the analyst might be proficient in one or perhaps two methods or tools, he or she should be open and able to adapt to working with other methods. Rather than briefly introducing different methods, we will focus on the foundational areas. This will help the analyst to understand and be able to use different methods faster and more efficiently.

There is a life cycle to requirements that applies to all types of requirements regardless of how they are modeled or at what level of detail they are captured [148] (see Fig. 15.1). In essence, the analyst works with eliciting them (elicitation and collaboration). The elicited requirements are analyzed, iterated, refined and then captured in some form as models or textual descriptions. When a set of requirements is captured, they need to be prioritized. It is very rare that all requirements are equally important or that all should be done concurrently. With the priority set, work packages and releases are proposed for approval. Alongside the activities of capturing, prioritizing, and approving requirements, they are maintained for tractability, storing, and re-use.

Requirements can also change during the process. Changes cannot simply be accepted. They must be assessed before being incorporated but once they are captured (models are changed accordingly), they are prioritized and approved. There are different types of requirements. When working with change, each type of requirement has its own specific place and role. At higher levels, we have business requirement defined as high-level statements describing the main requirements for enabling the business need to be satisfied. We also have stakeholder requirements that consider the need of a stakeholder or a group of stakeholders such as users, customers, partners, supplier etc. The solution is often defined using functional requirements that describe what the software product should do and how to behave in

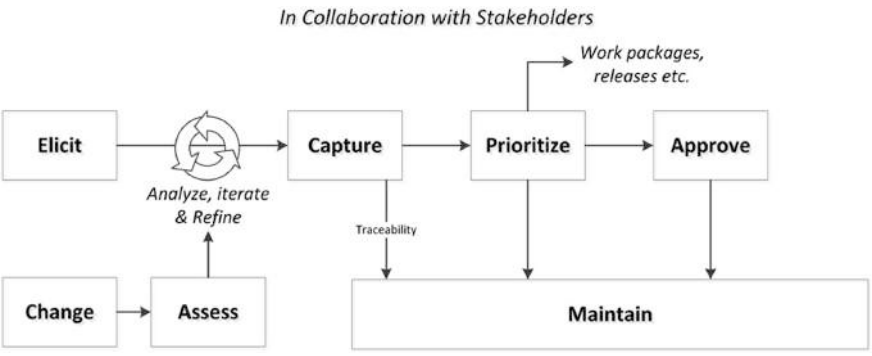

Fig. 15.1 Requirement life cycle (based on [3])

given certain conditions. The whole system has non-functional requirements (also sometimes referred to as quality of service requirements) describing how the system should operate as opposed to its specific behavior and functions. Another type is data requirements covering aspects that define the data content and structure of the solution. Finally, there are also transition requirements clarifying what needs to be fulfilled in order to implement a solution into its new real-world business context.

Regardless of what type, the process by which requirements are managed is mainly the same. These are, particularly at this stage of the design analysis, as follows [3]. Note that these steps correspond mainly to the "capture" activity of the requirement life cycle discussed above and in essence, detailed description of that step:

- **Specify and Model Requirements:** which is about using different analytical methods to capture, model, and describe requirements and designs.
- **Verify and Validate Requirements:** that is ensuring (verify) that the requirements are at the appropriate level of detail and are of sufficient quality. Validate requirements or in other words, examine and ensure that the requirements and designs are aligned with the goals of the initiative and will bring the desired value.
- **Define solution options by identify:** examine, explore, and describe alternative ways or design options to meet the requirements. The analyst will also analyze potential value and recommend the solution by assessing and comparing the business value each design option will deliver and recommend the best option.

In addition to the points briefly described above, we will also discuss two additional aspects related to designing solutions. The first is about eliciting requirements from business process models. Traditionally, requirement elicitation methods are born of IT and predominantly have an IT perspective. Business people think in terms of workflows or processes. Business process models are therefore easier for business people to follow. This allows the business people to discuss requirements from the perspective of their processes rather than from an IT perspective, of which they might be unfamiliar. We cover this aspect as eliciting requirements on the basis of process models is usually not covered in standard elicitation courses. We will also discuss the requirement life cycle. Although the requirement life cycle is not specifically part of designing the solution, it has an important relation to this phase. During design, the number of requirements grows, and it is important to manage them efficiently.

15.1 Specify and Model Requirements

The main purpose of specifying and modeling the requirements is simply to detail the requirements by analyze, refine, put together, synthesize and capture the requirements and designs. As input, the analyst has a fairly good view of the current

state, the future state, the gaps, and the change strategy. The job now is to take those inputs and detail the solution. In specifying and modeling the requirements, the analyst will predominantly work with and choose the modeling format (including the level of abstractions and viewpoints), analyze, capture, and describe the requirements. Let us take a look at these elements.

15.1.1 Choosing Models

As requirements are elicited, analyzed, and discussed, they need to be captured or represented. Textual description alone is often not enough. Although textual descriptions can capture the requirements in detail, it will become difficult to find, understand, and work with a collective mass of requirements. As such, textual descriptions are better used for enhancing models by explaining important details. But the question remains regarding the choice of models. Some models focus on representing people, roles, and their relationships while others capture the data perspective of a particular domain or solution. The analyst will have to choose the models that are best suited for the context. Furthermore, it is always better to use models from different categories as each model presents the situation from a single viewpoint. In BABOK [3], the different models have been categorized in the following way:

- **People and Roles:** Models falling into this category focus on representing and depicting peoples, a group of people, roles, organizational units, organizational entities, and their relationships with each other. These models view the problem or the solution from the perspective of stakeholders and their roles. We have previously discussed some of the models in this category such as models capturing organizational structures, and stakeholders (stakeholder wheel or onion, and the RACI matrix).
- **Rationale:** Models that capture the rationale, share the commonality of trying to analyze the question of "why". A few examples of such models are different problem analysis models, scope analysis, and business model canvas. The problem analysis models such as the fishbone diagram and the five why method aim at understanding the root cause of the problem and as such take a closer look to analyze the reason or the "why" a certain initiative is being investigated. In a similar manner, scope modeling tries to define the boundaries of the issue. Although it does not directly address the "why", it aims at giving the problem or the solution some boundaries.
- **Activity Flow:** Models that capture the flow or sequence of tasks, activities, or events in some form, such as, process models, use cases, scenarios or user stories, fall into this category. Such models are essential and should almost always be included. They describe how things are done and how any changes will affect such flows and therefore, should be modeled. Furthermore, such models are intuitively easier to understand by end users and non-IT resources.

- **Capability:** Models that take the viewpoint of capabilities focus on what an organization can and does offer. We have previously discussed capability models that capture exactly that, the capabilities of an organization. Business model canvas and analysis also capture the capability of an organization but from a more holistic viewpoint.
- **Data and Information:** The final set of models share the commonality of focusing on the data and data flow perspective of a particular problem or solution. These models are most often closely connected to information systems and have been influenced by that domain. Examples of such models are entity relationship diagram, data flow diagrams, and various models capturing the IT structure such as the interface models.

Models present the captured information either as matrices or as diagrams. Matrices have the benefit of being able to manage larger data sets that have some form of uniform structure. A data dictionary can present a large number of definitions and as each definition follows a uniform structure, it can be presented as a table (matrix format). However, if a data dictionary was to be presented as a diagram, it would not be able to contain more than perhaps a handful of definitions. In addition, it is possible to capture more data with a matrix format as compared to diagrams. When capturing a gap analysis, it is possible to add additional columns that contain valuable information allowing for visualizing prioritization in a structured way.

Diagrams, on the other hand express the information visually. When the complexity of the problem or the solution is high, it is difficult to capture it properly with just text or matrices. Much will be lost, and it is difficult to get an overview of the situation. However, visual expressions of such cases allow for a simplification that captures the complexity in an understandable manner. If an entity relationship diagram was to be expressed in words, it would be very difficult to get a grasp of all the relationships. A model allows for an overview in a way words are unable to capture. Most of the models we have discussed present information as diagrams in different forms, such as process diagrams, models of scope, and relationships between organizational structures, data objects, or IT systems.

15.1.2 Model and Analyze Requirements

Models have implicitly been selected during the current state analysis. It makes sense to re-use the same models. However, those models will be at too high a level and therefore, need to be captured in more detail. It is fully possible that additional models are added at this stage. For instance, the business model canvas has more usefulness and value at a higher level when the contexts and perhaps needs are being explored and discussed. As such, the canvas will most likely not be valuable when detailing requirements.

One of the most time-consuming parts of the work of a business analyst is the detailed elicitation, specification, and modeling of requirements. The modeling and analyzing work are not just about collecting and documenting requirements. At this stage, the analyst must take a closer look to see if any of the requirements or parts of a requirement needs to stay, be changed, modified, or deleted. When dealing with requirements at this level of detail, missing components can be identified and added accordingly. At the same time, there might be requirements that can be removed without compromising the desired value delivery. Finally, some requirements might need additional inputs, impose restrictions on other requirements, or work under certain assumptions. These factors need to be elicited because if they are overlooked, it might cause expensive reiterations later.

Fortunately, there are a number of tools for modeling and managing requirements. Most of the models we have discussed have tools or templates to assist the analyst. We noted previously that, at this stage, the number of requirements grows, and it will be necessary to have a structured method to keep the requirements organized. To this end, we will discuss the principles of requirement life cycle management, but it should be noted that there are tools to help the analyst. For smaller projects, it is possible to keep track of the requirements but when the projects get larger, a tool is highly recommended. Although there are many tools available, it seems that the most common way companies capture and work with requirements, is still word processing tools such as Microsoft Word.

As the requirements grow in numbers and start covering different areas of the solution, it will become increasingly important to ensure that the requirements are free from internal inconsistencies and conflicts, and that the collection as a whole will create the desired values. This is referred to as defining the requirement architecture. The main purpose of this part of the analysis is to ensure that the requirements will collectively deliver the desired value. Another important aspect is to better understand how requirements in one part of the solution affect or have dependencies to requirements in another part. It might happen that there are trade-offs that need to be made and, in such cases, a requirement architecture can support making good decisions.

At this stage, the stakeholders are still very relevant and important to ensure that the right solution is being built. The devil is in the details. The requirements need to be approved by relevant stakeholders. As such, how the requirements are presented matters. Although they are at a more detailed level, they still need to be presented to various stakeholders. However, not every stakeholder will require or even find it valuable or understandable if presented with detailed requirement specifications. Therefore, it will be necessary to capture and represent the requirements at different levels of abstraction and from different viewpoints depending on who the stakeholder is and what their particular expertise and interests are.

15.1.2.1 Use Cases

There are many tools, languages, and approaches to represent requirements for a software solution. One common method is "use cases" [149, 150]. Use case is technology independent i.e. one does not need IT knowledge to understand and work with use cases. In a way, use cases tell a story of a case in which someone interacts with a system, i.e.:

1. Use case diagram illustrates the overall view of the behavior of the system and how users interact with the system. Note that there is a difference between actor and stakeholder. In this context, a stakeholder is anyone interested in the system but might not act in any of the use case scenarios. An actor is anyone or anything that interacts with the system.
2. Use case narrative that gives a step by step description of how the users interact with the system.

Figure 15.2 shows a simple example of a use case diagram. In this diagram, we can see that there is a symbol of a human being. This symbol represents the actor. An actor is a group of users that use the system in the same way. Credit card holders who wish to withdraw cash from an ATM machine are a group of users who use the ATM machine (the system) in the same way. They all insert their credit card, enter their pin code, and enter the amount they wish to withdraw. As such, they are represented in a use case diagram as an actor. We can also see that the use case diagram has an oval shaped symbol containing text. This symbol represents a distinct business functionality of the system. These are called use cases and should be named in the grammatical form of a verb followed by a noun. For instance, "make appointment" or "withdraw cash". Furthermore, we can see in Fig. 15.2 that there is a rectangular line around the use cases and that the actors are outside of this rectangular area. This line represents what is called the "system boundary" and defines the scope of the system. Systems are limited in their functionality and, by defining the boundaries of the system we are making statements as to what the system will include in terms of use cases. The system boundary does not necessarily have to be one single IT system but could also represent a set of systems.

Actors and use cases have relationships between each other. These are also captured as can be seen in ameter and the rows represent a speci15.2. The relations can either be "include", "extend", or "generalization." An "include" relationship, denoted as ≪include≫, says that the functionality of one use case, uses or includes the functionality of another use case. The arrow shows which use case needs another use case in order to do its job. When a customer withdraws money from their account, the use case "withdraw funds" will have an include relationship with the use case called "update balance." This is quite natural as when someone withdraws cash form an account, the account balance needs to be adjusted. An extend relationship is different. For an extend relationship, one use case needs to be the "parent" and the other the "child." In such a relationship, the "child" use case adds to the parent use case. A child use case is a use case that is needed if a certain

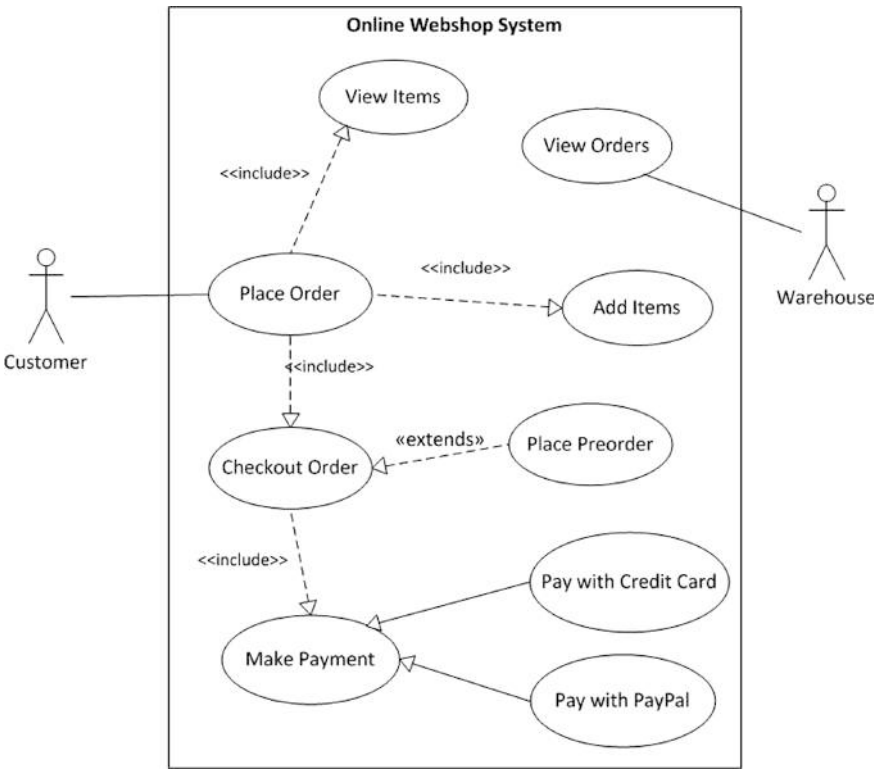

Fig. 15.2 Example of a UML diagram for an online web shop

condition applies but not otherwise. Take the case of an actor withdrawing cash from an ATM machine when the machine has run out of money. When this condition applies, the system sends a notification to the bank. In this context, the parent use case "withdraw cash" is extended with "notify bank." In other words, when a specific condition is fulfilled (no more cash in the ATM machine), another use case is needed. However, the child use case is not needed or used when there is cash in the ATM machine. The relationship is drawn from the child to the parent use case with the arrow directed towards the parent. The dotted line is marked as ≪extend≫.

Finally, there is a "subtype" relationship. Similar to the extend relationship, generalization relationship also works with parent and child use cases but with a difference. The child use case is a specialization of the parent use case. If an actor wants to make a phone call, the system has a use case called "make call." This use case is the parent but there are two different types of calls that can be made. One is domestic and the other international. In such a case, the parent use case "make call" can have two child use cases namely "make domestic call" and "make international call." These child use cases have a generalization relationship with the parent (make

call). There is a distinct difference between extend, and generalization relationship. A use case that has an extend relationship with a parent cannot be used independently. Simply put, a parent use case cannot be replaced by its child. The child use case can only function if a specific condition of the parent applies. A use case with generalization relationship, on the other hand, can replace the parent.

Let us take a closer look at Fig. 15.2 describing the online web shop. We can see that the actor (the symbol of a person, called customer) can create an order. This function is within the system boundary (the rectangular border). This use case (create order) includes the use cases "view item", "add item", and "checkout order." To create an order, it is necessary to use the other use cases. Let us assume that the customer added an item to the cart that has to be released. The customer can still order and pay for it. If the specific condition is of an item not having been released, at the time of checkout, it is pre-ordered. Therefore, "checkout order" is a parent use case and "pre-order item" is a child use case with an extend relationship to "checkout order." Note that the use case "pre-order item" cannot replace the "checkout order". The customer also has to pay for the items. The use case "make payments" is a general one with two subtypes, one being to pay with a credit card and the other with PayPal. Therefore, there is a generalization relation between the children ("pay with credit card" and "pay with PayPal") to the parent ("make payment").

Generally, the process follows the steps outlined below:

1. Identify sources of information i.e. gather the information (or persons and other sources where the information is) needed to model a use case diagram. The first step is quite similar to the selection of who should be part of a workshop as discussed previously. In this setting, it is important to have the people who have relevant knowledge and information of the area being modeled. It is also useful to consult other sources, such as, work instructions and descriptions of the system or processes from previous projects. This step is similar to other types of elicitations such as workshops discussed previously.
2. Identify the actors i.e. those customers, partners, or other external users that use the system being modeled. In this step, the main idea is to identify as many actors as possible. It is always possible to reduce or merge the actors, so it is better to have more and then reduce than have missing actors:
   - To facilitate the identification of actors, it might be helpful first to consider the customers of the system or the business process.
   - Following this, focus can be put on external partners that, in some way, have a relationship with the business system.
   - Then it might be valuable to consider the internal roles, positions, or business units that use or interact with the business system. Finally, it is helpful to consider external systems that interact with the business system in question.
   - Following this, it is appropriate to consider the actors and "clean" the list to only include actors that have interaction with the system and represent a group of users that use the system in a homogenous manner.

   - Identify the use cases of the system that the actors can use or draw upon. In a similar manner to the previous step, it is good to identify as many relevant use cases as possible. It might be helpful to consider the question of what products and services are offered, used or involved the customers, external partners, suppliers, internal roles, positions, or business units?

3. Identify the relationships between the use cases i.e. connect the actors and the use cases. This is simply achieved by iteratively asking which actors, customers or external parties interact with which use case available to them. In this part, we also have to agree the systems boundaries. Boundaries are defined by discussing what is within the system and what is to be excluded.
4. Model the use case diagram (although this happens concurrently with the previous steps of identifying the actors, use cases and their relationships). In modeling the use case diagram, it is helpful to consider a few aspects:

   - Are the use cases listed related to each other in a way that makes them "belong" together? The use cases (and the other aspects) should have a direct relationship. If a few use cases are not directly related to a certain number of actors, it might be that they belong to another separate use case diagram. The actors and the use cases within one use case diagram must be directly related to each other.
   - If the number of actors is large, it is a clear indication that the use case must be divided into several use case diagrams.
   - Does the use case offer a complete product or service? If it doesn't then some parts are missing. A use case diagram should be "complete" from the perspective of a service or part of a service. Consider for instance the example of the ATM machine. If a use case does not capture the withdrawal of cash, it is simply incomplete as the use case does not achieve the aim of delivering a product or service.
   - Finally, make sure that the use case is triggered or initiated by an actor. If not, then it is more an internal activity and not a use case diagram.

5. Verify the use case diagram. Upon having completed the model, it is worth taking a fresh look to check that all the important aspects are covered and that nothing important is missing.

Use cases can be defined at different levels of detail. At the highest level (less detailed), the use case serves the purpose of communicating the goal. At the next level of detail, the user goals are in focus and use case diagram gives an answer to the question of "what." Finally, at the detailed level, the use case diagram captures details to show "how" it will work and therefore, there is room for the business analyst to capture details if needed.

A good use case should have the following characteristics:

1. It should start with the actor making a request or initiating some service.
2. It should end with an outcome that satisfies all requests or initiations made.

3. It should define the interactions between the actors and the use cases and between the use cases related to the use case in hand.
4. It should be from the actor's perspective, not the systems point of view.
5. It should describe the interactions and not focus on the internal system activities and relations.
6. It should be easy to read and understand.

15.1.2.2 Use Case Narrative

The use case diagram represents the interaction between the actors and the system but does not provide any detailed information. The use case narrative [149, 150], on the other hand, does exactly that. The combination of use case diagram and narrative offer a comprehensive description of the use case. A use case narrative is simply a textual description of the events that take place in a certain use case. The purpose is mainly to elicit all the aspects of the use case to avoid misunderstandings and interpretations. There are several ideas about how to write use case narratives. There are three ways it can be recognized, a brief style, an informal style, and a formal style.

The brief style is used in the early stages of the requirement elicitation. The brief style is as it is named, a short description giving a quick overview of the subject and the scope of the use case. The informal style is a bit longer and consists of a few paragraphs aiming at giving a summary of the use case. The formal way of writing narratives includes a detailed description of the use case.

Let us return to the use case diagram in Fig. 15.2 and write an "informal" narrative. It might look something like the following:

> *"The actors are the customer (who buys) and the warehouse (who fills and sends the items). The customer will place an order after having viewed and added the items they want to buy. The customer will then proceed to checkout. If any item selected is not released yet, the customer will be asked if they wish to place a pre-order. If so, the customer will be informed of the estimated delivery time. The customer can then pay for the order with a credit card, in which case they fill out the necessary information. The customer can also choose to pay with PayPal. Once the payment is completed, the customer will receive an order and payment confirmation. The warehouse will view orders and fill them accordingly."*

Let us now take a look at a formal narrative. As you will notice, the captured information is at a much more detailed level. Usually formal narratives have structured the information as a table with specific fields that are to be completed. Below is an example of a possible formal narrative for the use case diagram discussed above. Note that all the text of the formal narrative is in italics and explanations in regular text format. The first thing is to give the use case a name. It is also possible to add other parameters here such as use case id and priority.

15.1.2.3 Use Case Name: Place Order

Following the definition of the use case name, the actors of the use case are to be defined. In some cases, it might be valuable to also include stakeholders in addition to the actors. While this is not mandatory, the actors have to be defined.

Actors:

- *Registered customer (a customer with an existing account and who possibly already has provided shipping and billing information such as address)*
- *Warehouse (staff that fills the orders and sends it to the customer)*

Following this, the trigger or the event that starts the use case is defined.

Triggers:

- *The customer wants to buy the items.*

Next, preconditions are defined. Preconditions state what has to be in place for this use case to be possible.

Preconditions:

- *The customer has chosen the items they want to buy.*

Following this, the post-conditions are defined. Post-conditions define what needs to be achieved for the use case to be successful.

Post-conditions:

- *The order is placed in the system*
- *The customer receives an order confirmation with estimated delivery time*
- *The customer receives confirmation of payment made*

The next description concerns the normal flow or the steps that will be taken if everything goes as it is supposed to.

Normal Flow:

1. *The customer places the order.*
2. *The system presents the shipping and billing information to the customer.*
3. *The customer confirms the shipping and billing information to be used for this order.*
4. *The system presents the items, the sum total, and the total shipping costs of the order.*
5. *The customer confirms the order information.*
6. *The system shows the estimated delivery date.*
7. *The customer makes the payment for the order.*
8. *The system informs the customer of the order being finalized.*
9. *The system forwards the order for fulfillment.*

10. *The warehouse will fill the order and send it to the shipping address.*
11. *The customer exits the system.*

The above steps depict the flow when everything goes as normal and as expected. However, that is not always the case. For defining a use case narrative, we also need to look at when things do not go as expected. These are called alternative flows.

Alternative Flows:

Alternative flow 1: The customer wants to use a different shipping and billing address or update existing addresses.

1. *The customer chooses an option to use a different billing or shipping address.*
2. *The customer enters the desired shipping and shipping information.*
3. *The system updates the order with the new shipping and billing address.*
4. *The use case continues.*

The example above is a simplification and far from comprehensive. However, it serves the purpose of illustrating the main elements of a formal use case narrative. There are differences in what information is captured in the formal narrative. Some narratives might include frequency of use. This narrative can be made at a more detailed level. The level of detail depends on the purpose. If the purpose is to capture the requirements at a higher level, then it is not necessary. On the other hand, if the use case is to be used by the programmer to develop the solution, then the details are required. The programmer is not supposed to make up alternative flows or determine what should be done in different cases. The programmer should have that information from the use cases as they are the requirements.

15.1.2.4 User Stories

You will have noticed that formal use cases require one to know about the requirements and to gather this information before the development starts. As such, it is more aligned with predictive approaches of software development. From the perspective of the agile manifesto, such documentation is excessive and not optimal. Therefore, user stories have become part of agile approaches. User stories [151] try to move the focus from writing requirements to having conversations about them. A user story is a short story told about the desired functionality described with simple description from the perspective of the customer, client, or a system. User stories follow a very simple template that helps define "who", "what", and "why." In other words, one or two sentences answer these three questions. The template used is as follows. "As a [user], I need/want to [what], so that [why]." An example of a simple high-level user story can be "as a customer, I want to view the products, so that I can select those I want to buy." We see that this user story describes "who" cares or wants this functionality. The functionality desired is to "view products" and the shopper wants to do this in order to "select what they want to buy".

The user story is written from the perspective of the user and their reason for needing or wanting the functionality. It is the user who will want or need the functionality. If the user or the reason for why a user wanting functionality is unknown, there is no point in writing the user story. The matter simply needs further investigation. User does not mean one particular user but rather a "persona" (as discussed previously). This concept is similar to that of "actor" in use cases. Using personas has two main benefits. Personas simplify who the user is. It is easier to work with a typical representation of a group rather than discuss all the different individual users that might interact with a product. Secondly, using personas helps to keep the focus on the perspective of the customer. This enables the focus to be on the "right" user stories because the focus is on the "who" for whom the product is being developed.

User stories are supposed to be created collaboratively rather than users writing stories and handing over to developers. User stories are elicited through discussions between the product owner and the development team. A user story should also be refined and worked on until it is ready. One single statement is not enough. During the conversations that the product owner has with the developers, the story is explored and more details behind the story are elicited. A part of these conversations is to identify "acceptance criteria" (sometimes called "confirmations"). Acceptance criteria are statements that help the team better understand what the solution should have and what to deliver. These criteria are used to validate that the user story has been implemented correctly. Let us return to our user story we discussed earlier, of "as a customer, I want to view the products, so that I can select those I want to buy". The acceptance criteria for this user story could be as follows:

- View products per category
- See a small picture of the product
- Click to see more detailed product description
- Click to add product to cart

These acceptance criteria not only define and detail the user story better but also aid in determining if the developed solution is good enough or not. In a way, the acceptance criteria are the way the user story is tested. Acceptance criteria could also be viewed as certain conditions that need to be fulfilled before one can claim that the user story is developed or "done."

The user stories should not be too big or too small and it is important to gain a shared understanding of the user stories. Bill Wake created what he termed INVEST that defines the characteristics of a good user story. INVEST stands for the following:

- **I for independent:** The user story is supposed to stand alone by itself, not being dependent on another story. If several smaller user stories are very dependent on each other, it is perhaps better to merge them and treat them as one. Having independent user stories allows for more flexible scheduling of product backlog items.

- **N for negotiable:** A good user story is not defined in detail but rather, captures the essence of what is needed. This allows for some room of negotiation between the developer and the customer. The best design is seldom exactly what the customer wants so room for negotiation opts for better solutions.
- **V for valuable:** The user story needs to be valuable to the "who" of the story, the customer. Therefore, a good user story is one that delivers value to the end user.
- **E for estimable:** A user story that is estimable is a good user story. It is important to bear in mind that at this point, it is not about seeking an exact estimate. However, the user story should be of such character so as to make an estimate that helps the customer to rank and determine when (scheduling) to develop it. Commonly, bigger stories are more difficult to estimate.
- **S for small:** Good user stories are small. The size can be seen as the estimate of how many weeks of work is required. As such, a user story should not require more than a few weeks (actual hours spent on development). If the user story is estimated to be more than a few weeks, there is a high probability that the story has not been really understood by everyone, particularly the developers.
- **T for testable:** A user story must be testable. There should be a clear idea of how to test the functionality. If the customer does not know how to test it, the user story is probably not clear enough or perhaps the user story is not valuable. However, it can also be that the customer doesn't know how to test it. Regardless, the user story has to be testable for it to be good.

The user story should also include "priority" and "estimate." The priority simply denotes how important the user story is. The scale used for prioritizing varies but could be as simple as numerical values where "5" stands for "very important" to "1" for "not important." It could also be in text format such as "very high", "high", "medium", and "low" or according to MoSCoW which stands for "must have", "should have", "could have" or "won't have." Similarly, the agile team will define how the estimate should be made. It could be an estimate of how many man-hours, days or weeks, it would take to develop. The method does not matter as much as the fact that an estimate is made and recorded. The idea is to write each user story on an index card where the user story, priority, and the estimated size is written on the front and the acceptance criteria on the back. However, there are numerous tools that allow for recording user stories digitally. Regardless of what tool is used or how the user stories are documented, the basic concepts are as described above.

Let us take a look at a few more examples of user stories and acceptance criteria for the online shop (note that these are not complete).

"As a customer, I want to review my shopping cart, so I can decide on what I want to buy."

- See product and quantity of items in the shopping cart
- See total amount to be paid including shipping costs
- Change or remove amount per product

"As a customer, I want to "checkout", so I can get my products shipped to me."

- Enter or change shipping address
- Enter or change payment details
- Checkout and finalize the order

"As an order fulfillment agent, I want to print labels, so I can ship the packages."

- Print labels for all new orders
- Automatically connect the package with the shipping system to create a new tracking id
- Update the order with the tracking id

15.2 Business Rule Analysis

The day to day operations of an organization are guided by a large number of business rules [152–154]. These rules are so embedded in the operation that we take them for granted. When ordering from an online store, you might have seen a text stating that to ensure delivery the next day, the order must be submitted before a certain time. Similarly, when sending mail there is a notice on the postbox stating that it will be emptied Monday to Friday at 16:00 and on Saturdays at 13:00. Yet another example is when boarding flights or ferries. If the customer is a gold or premium member, they are entitled to fast track or priority boarding. But who can become a gold or premium member? Again, there are rules in the organization that state who will be awarded with gold memberships. It might be customers who travel more often that once a week, or as is the case with credit cards, those who use their credit cards for sums above certain thresholds. These are business rules.

As can be seen, business rules guide the day to day operations of an organization. However, for it to be considered as a business rule, it has to be within the control of the organization or in other words, under the jurisdiction of the business. If it is a "rule" or rather a "law", such AML (anti money laundering), it is outside the jurisdiction of the company, much like the "rules of mathematics." Then it is not a business rule. A business rule must be under the control of the company, so they can create, enact, change, modify, or discontinue their business rules. As such, we can define business rules as directives or conditions that determine or guide the behavior of the business. In essence, decision points where each rule provides guidance for decisions.

Business rules, in addition to guiding the day to day operations, need to be practicable or actionable as well. This means that it is specific to providing guidance as to what to do. If it lacks this characteristic, it is not a business rule but perhaps a business policy. Consider a development company producing software for customers. Such a company would most likely consider quality as very important and say: "we produce high quality software." Such a statement is within the jurisdiction of the company, but it is not actionable. It is difficult for the employees to know

what to do or to be guided by this statement. What does "high" or "quality" mean? As such, it is not a business rule but rather a "business policy." Business rules can be derived from business policies. From this policy, the following business rule can be derived: "We only supply software to our customers if tests result in a bug count of 3% or less." This rule is both under the control of the company and actionable. Likewise, a construction firm might have "safety is our first concern" as a policy and "the wearing of safety helmets is mandatory on all sites" as its business rule. In short, a business rule needs to (1) be under the jurisdiction of the company, (2) dictate or guide employees in taking day to day operative decisions, and (3) be actionable. Business Rule Analysis covers the identification of business rules, capturing and validating, working with changing, modifying, and refining, enabling reuse and organing them.

15.2.1 Identifying Business Rules

Business rules can come from a variety of sources. Figure 15.3 depicts the main ones. We have already discussed business policies as one source; benchmarking is another. Benchmarking is when a company compares itself, and its best practices, with the industry's top performers. Such comparisons might reveal opportunities for improvement that can be capitalized on. When incorporating such changes in their own operations, it oftentimes results in introducing, adapting, changing or modifying business rules.

Regulations are another source of business rules. Consider for instance the AML regulation mentioned previously. A company can comply with such a regulation by introducing business rules that ensure that the day to day operations are in agreement with the law. Yet another source of business rules are contracts that companies sign with external stakeholders such as suppliers or customers. A company has signed an agreement with customers to supply them with certain products, and as the order is large and the customer is important, the contract has specified a time of delivery. For the company to comply with the contract, they might have to introduce business rules that influence the day to day operations. Such a rule might be as follows; "priority customer orders are to get preference over other orders."

Another source of business rules is the staff, the subject matter experts, and the domain experts. The employees who do the work, who have been involved in implementing solutions, have discussed and decided about different solutions, and who take all day to day decisions are therefore, a source of business rules. Some business rules can be found in instruction manuals, and other documents available in the company. Finally, business rules are also captured in the code of the information systems. Sometimes, business rules are in the code and the information system simply follows them. However, the employees might not always be aware of them or understand why the system is doing things in a certain way.

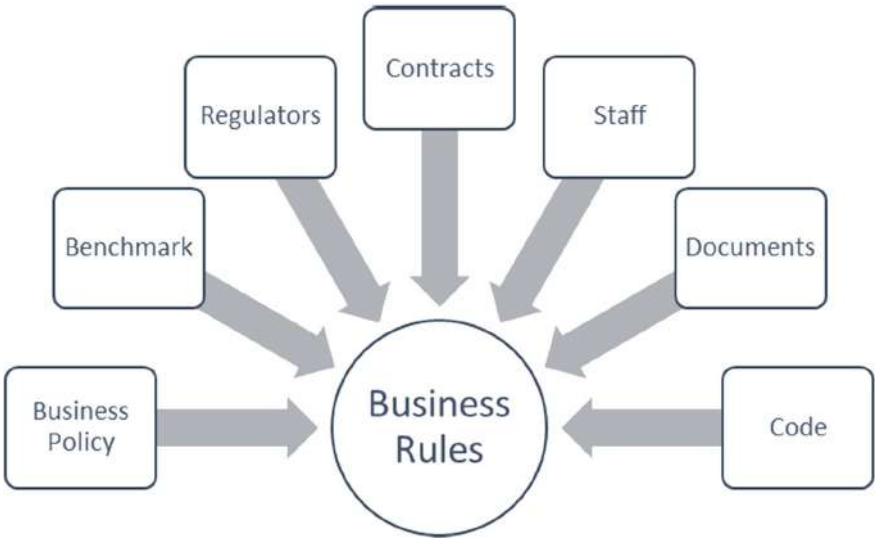

Fig. 15.3 Sources of business rules

15.2.2 Working with Business Rules

The elicitation of business rules is no different from eliciting information about requirements or stakeholders. The analyst can use a wide range of elicitation such as interviews, workshops and document analysis. Business rules should follow the following principles.

- When explaining the business rules, it is important to use the same business vocabulary to avoid any confusion about which data is being referred to. The rules should use the terms defined in the data dictionary. Also, it is important to ensure that the names are aligned with the requirement documentations.
- Business rules are in a declarative manner i.e. they capture a desired state that is suggested, required or prohibited. They do not describe steps to be taken to achieve the desired state.
- Each business rule should be atomic i.e. it should capture the rule and the rule only. The business rules should not include descriptions of how they will be enforced or what will happen if they are violated. Adding such information will quickly increase the complexity of the business rule and become an obstacle for understandability.
- Business rules should also be captured independently from the process they support or constrain. Likewise, they must not be technology or system dependent as a business rule might require implementation in several processes or IT systems. They are therefore expressed independent of any solution that enables their application.

Business rules analysis also covers maintaining the rules in a manner that facilitates tracking and monitoring. The business evolves and as it does, business rules might be in need of modification or retirement.

15.2.3 Definitional and Behavioral Business Rules

Let us consider two different business rules:

(1) *"A premium customer is one who orders items of up to €2.000 per year"*
(2) *"A premium customer receives free shipping"*

There is a difference between these rules. If we look at the second rule, it can be violated or in other words, a premium customer might place an order and still be charged for shipping. However, the first rule cannot be violated as it is expressing the criteria for categorizing customers as premium or not. A premium customer might be charged for shipping (violation of the rule) but the customer will still be a premium customer. That is not compromised.

Definitional rules are either "classification rules" or "computational rules." The example above is a classification rule as it uses the known facts to classify whether the customer is premium or not and clearly this rule cannot be violated. A computational rule on the other hand, while still being definitional, is derived by applying calculation or inferring from the known data. For instance, a business rule stating that "the price of a product is its price + vat."

Behavioral rules (also referred to as operative rules) can be violated. If a rule, automated or not, can be violated, it is a behavioral rule. These are the rules that directly determine or guide the employees on how they are to do their work on a day to day basis.

When working with business rules analysis, it is wise to be cautions. Any given organization will have many rules. While rules are important for the delivery of a good solution, the analyst cannot engage in massive business rules analysis. The time required would be at the cost of other more pressing activities. There are software systems supporting business rules called Business Rules Management System (BRMS) useful for defining, monitoring, and maintaining business rules. However, it is no easy matter to set up such a system, to learn how to use it, to load it with business rules, and maintain the rules. Such an effort will require organizational support and decisions made to consciously work with business rules analysis.

15.3 Decision Modeling

Previously we discussed business rules such as "a premium customer receives free shipping." Naturally, there will be a few rules about shipping costs for non-premium customers. This does not mean that all non-premium customers will

pay for shipping, but whilst the business rule states that shipping is to be charged, it does not specify by how much. As such, we know that shipping is to be charged but depending on a certain set of data, the amount must be decided upon. A decision model captures how certain parameters and their values are combined to make specific decisions for each case. In a way, decision models extend business rules to a much more detailed level.

Decisions are requirements in some form but the common methods for capturing requirements does not allow for a structured and clear representation of decisions [155]. Consider use cases where actors and their relations to functions are captured. In the example of an online web shop, it was stated that a customer can pre-order an item that has not yet been released. However, the use case does not allow for a structured way to capture which items should be possible to pre-order, if certain customers (such as premium customers) should receive pre-ordered items before other customer groups. Similarly, the use case diagram does not show how much the shipping is to be dependent on a set of relevant parameters. The option is to capture such aspects as text format. However, the decisions soon become complex and it will be very difficult to manage them in text format without errors sneaking in.

Business processes (or workflow charts) can capture decisions as gateways. Gateways are decision points, but they are not suitable for modeling decisions. Business process models capture decisions but at a higher level of granularity. Although it is possible to capture the decisions with gateways in process models, it is not recommended. The reasons being that the process models become very complex, and many gateways are needed to capture fairly simple decisions. Let us assume that the shipping of goods is dependent on the weight and the size of the package, and on where it is to be shipped, if it is to be cheapest option (land) or faster (air), and the fragility of the goods. In essence, each of these parameters will require a gateway. Even if each gateway only has two outgoing options, the above example will crowd the process model. Such models are not easily read, understood, and useful for the project. The decisions rules are therefore, spread over the process models but not in focus. As with the use case, decisions must be captured outside the process models. It is also possible to capture both rules and decisions in requirements, but such representations capture the importance of the rules and not necessarily how decisions are made. To capture the decisions in more detail the analyst will need to rely on text, which has its limits.

In light of the above context, decisions are best modeled separately from use cases or process models in a way that serves the purpose and complexity of decisions. Decisions are normally modeled using tables, decision trees, or graphically. Decision tables have columns, each of which represents a parameter and the rows represent a specific case (see Table 15.1).

As can be seen from Table 15.1, detailed decisions are captured in a structured manner that is easy to understand and follow. It is also possible to model the decisions as a decision tree; however, they are not used as they have limitations when making complex decisions. The tree will quickly grow and have many "leaves" as the conditions increase. Figure 15.4 captures a small set of the decisions of Table 15.1 as a decision tree.

Table 15.1 Example of decision table

Shipping costs				
Continent	Speed	Weight (kg)	Fragile	Price category
EUROPE	Standard	<0.1	No	A
		>0.1	No	B
		<0.5		
		>0.5	No	C
	Express	<0.1	No	D
		>0.1	No	E
		<0.5		
		>0.5	No	F
	Standard	< 0.1	Yes	E
		>0.1	Yes	G
		<0.5		
		>0.5	Yes	H
	Express	< 0.1	Yes	I
		>0.1	Yes	J
		<0.5		
		>0.5	Yes	K

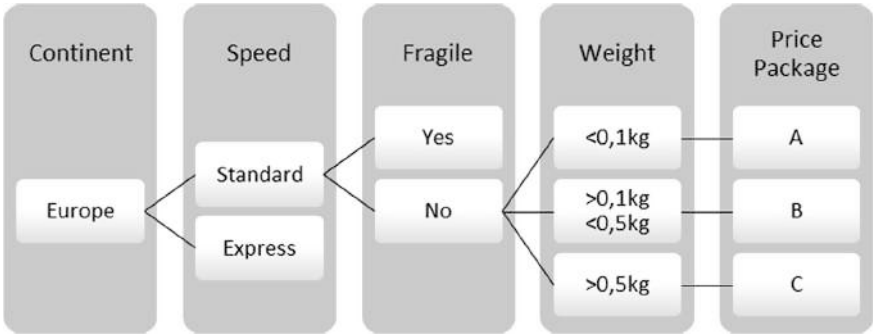

Fig. 15.4 Example of decision tree

Each symbol that leads to a "price package" (A, B, C etc.) in both Table 15.1 and Fig. 15.4, represents one single rule. As can be seen, the table format manages to capture more decisions in a structured way as compared to the decision tree. Another way to capture the decision, is by using a DRD (Decision Requirements Diagram). A DRD is simply a visual (graphical) representation of the relation between the input data and the knowledge required for complex decision making.

The essence of such representations aims at capturing the information that is needed to make a decision, where such information comes from, and how the decision is made. While it is possible to capture this information by using simple

text or self-made diagrams, there is much value in pursuing a systematic and structured way to model decisions. In almost all cases, the decisions tend to be complex, are dependent on other decisions, and are not easily managed if there is a lack of a structured method. Therefore, notations have been introduced for modeling decisions. There are several notations that can be used for such decisions models. Although they differ from each other, they share common fundamentals. As such, knowing one, allows the analyst to easily work with another. The notation that is growing and becoming standard, is DMN (Decision Model and Notation) [156]. This standard has been adopted by OMG and is similar to BPMN, in that it allows for modeling decisions in a variety of use cases. It supports decisions made by humans but also, automated decision implementation in software systems.

DMN is effective as it supports decision modeling for (1) capturing man made decisions, (2) capturing requirements for automated decisions, and (3) implementing automated decisions. As such, it basically covers the full spectrum. The elements of DMN are as follows:

- **Decisions (rectangles):** OMG defines a decision as an "act of determining an output value from a number of input values, using logic to define how the output is determined from the inputs".
- **Input Data (ovals):** Input data is the information that is used to make a decision.
- **Business Knowledge Models (rectangles with cut corners):** Business knowledge models are the business logic or the "know-how" that describes how the decision is to be taken (which output is to be chosen). The business knowledge model can be decision tables, a set of business rules, or derived as in the case with data analysis models. In essence, business knowledge models encapsulate how decisions are to be made.
- **Knowledge Source (document icon):** Knowledge sources capture the original documents from which the required logic has or can be derived.

In a decision model, the elements are connected and have a relationship with each other. For instance, a decision will have a connection with the input data. These connections are called "requirements" and are of three types. The first is "information requirement" representing an input data or a decision that is needed for a decision. Note that the output of one decision can be required as input for another decision. The second type is "knowledge requirement" which means that a business knowledge model is invoked for the decision. Finally, the third type is "authority requirement" denoting the dependency of a knowledge source.

Figure 15.5 shows a simple example of decision modeling using the DMN for determining the shipping rate. As can be seen, there are two decisions. The main decision is to determine the shipping rate and that is dependent on input data (continent, weight, fragility). However, there might be a discounted shipping rate if the customer is a frequent buyer. The decision to determine the discount rate is needed as input to calculate the shipping rate. The discount rate is decided based on

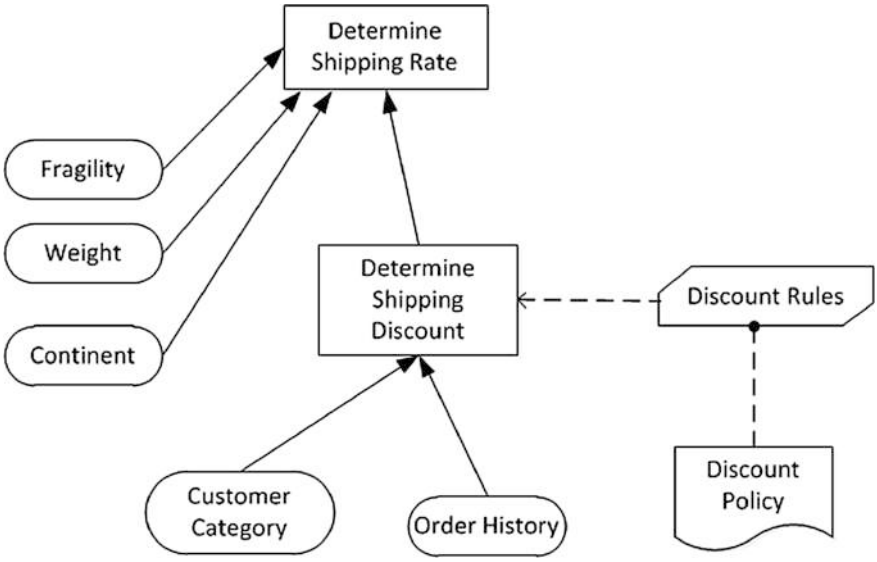

Fig. 15.5 Example of DMN

the customer type (such as standard or premium) and the volume of orders placed during a specified time period.

The shipping discount is determined by invoking a set of rules that dictate how much discount is to be given. These rules are in turn governed by a discount policy that the company has set. Having modeled the decisions with DMN, it is easier to see where the source of the rules is, where there are gaps, what data is required, and where there are opportunities for automation. In addition, such models are effective as a basis for shared understanding among team members and other stakeholders. The decision diagram in Fig. 15.5 does not exactly specify the discount rules. Such information is captured with decision tables.

15.4 Verify and Validate Requirements

Verifying and validating requirements concern the quality aspect of requirements. Verifying is ensuring that the requirements are captured in a way that they can be used whereas validating focuses on ensuring that they deliver value. From a quality perspective, requirements can be irrelevant, inadequate, or bad. Some requirements might be captured and illustrated in a very attractive way, in other words, they are very good but simply irrelevant. Irrelevant requirements, while not being "wrong", are those that are redundant. They simply do not help to clarify the solution; they cannot be tested; are out of scope. Such requirements can creep in and due to their irrelevance, working with them is a waste of time. Bad requirements are those that,

for some reason, do not provide the information needed. We will discuss criteria for good requirements in a moment. Finally, there are some missing requirements. When projects grow in size or complexity, it can be difficult to cover all requirements, and, in some cases, they go missing.

15.4.1 Verify Requirements

Verification of requirements focuses on ensuring the definition of requirement being adequate. Let us take a closer look at a few criteria:

- **Understandability:** One must bear in mind that requirements are written in such a way that it is aligned with its intended audience. Imagine a set of detailed requirements intended for high-level executives who are to decide about an investment. Will these "do the work" or will the executives be lost in the requirements? Another source of confusion might be the choice of notation. Executives might not be accustomed to certain notations and therefore, would not easily understand an entity relationship diagram notation. Using such a notation will certainly not help to convey the message. Requirements are meant to convey information in an easily understandable manner to an intended audience. As such, an aspect of the quality of the requirement concerns its fitness for use. A set of requirements might be perfect for executives but completely inadequate for software coders.
- **Completeness:** Another aspect to consider is if the requirements convey or hold all the information needed for further work. Completeness, therefore, depends on what the next step is. Certain models, methods or perspectives have their limitations or intended purpose which is reflected in the degree of details they cover. As such, a model might be considered as complete and fully adequate for further work whereas another model in the same situation is incomplete. Furthermore, as completeness considers further work to be performed, completeness is also related to the stage or phase of the analysis process. A requirement might be complete at an early stage but incomplete when it comes to the design phase of the process.
- **Atomic:** A requirement should be "self-contained," which means that one should be able to understand it without having to refer to other requirements. Each requirement should cover one function, and accurately describe what is going to be delivered.
- **Concise and unambiguous:** A good requirement is concise, includes only the information needed and therefore, free from all unnecessary descriptions, content or aspects. The conciseness also helps make the requirement clear. Unambiguous refers to the requirement being clear so that there is only one interpretation of its meaning. Clarity is essential so that multiple persons who read the same requirement will understand and interpret it in the same way.

- **Feasible:** The requirement should also be feasible. Usually, there are restrictions in risk, budget, and/or time that need to be considered. A good requirement considers these restrictions to ensure they are feasible.
- **Testable:** A good requirement is captured in such a manner to make it possible to test it and see if it has been successfully implemented and the requirement fulfilled.

The above criteria are a good start to ensure that requirements are of sufficient quality. It should be noted that the above criteria concern individual requirements. However, requirements seldom come alone. The set of requirements matters. As such, it is worth taking a quick look at some criteria to ensure that the set of requirements is at an adequate quality level:

- **Prioritized:** The set of requirements (and individual ones within the set) should have a priority indicating how important it is to have the requirement(s) implemented. The prioritization will depend on different factors, but it is important to have a good view of the relative importance of the requirements.
- **Consistent:** The individual requirements will, although each one might be perfect by itself, be of limited value if it conflicts with other requirements. The consistency should exist from high-level business requirements to low-level system requirements.
- **Traceable:** An aspect of a good requirement set is that it is possible to trace (both the set and the individual requirements of the set) to its higher level and lower level requirements. This also touches upon the ability to modify the requirements and being able to consider what other requirements will be affected.

The actual verification of requirements does not happen as a one-off event. Rather, it is a continuous and iterative process running concurrently with the requirement elicitation. It is done in parallel as the requirements are elicited and models created. An analyst might work with modeling a process. In this work, the analyst checks the policies of the company to see what notation is preferred or required. In the first instance, the analyst is gathering the data in a workshop. As the process model evolves, the analyst ensures that the basics of the process model follow the notation, but the focus is on the flow, not the notation. As the model takes shape, the analyst asks questions to fill in the gaps or parts that seem to be missing information. After the workshop, the analyst might model the process with a process modeling tool. As the model is generated, the modeling tool gives information, should the analyst try to model in a way that is not aligned with the notation being used. As the model develops, additional questions might arise, which the analyst seeks the answer to and uses the information to make the model complete. After the model is created, perhaps another analyst will take a look and comment. The analyst will check if the model is consistent with other processes, particularly those preceding or following this particular one. The stakeholders might take a look, and those who will work with the next step might be consulted to see if anything is lacking. The verification process is continuous to ensure that the

models and requirements are of an adequate quality. That might include activities such as ensuring compliance with corporate policies - standards, and guidelines for tools - models and approaches - continuously checking for missing parts - completeness - comparing with other models to capture inconsistencies - reviewing to make sure the right terms are being used - and perhaps adding explanations and examples for the purpose of clarification.

15.4.2 Validate Requirements

These requirements define what is going to be delivered. It is therefore important to ensure that the functionality that is to be delivered is the "right" one for the solution or to "validate" the requirements. Note that validation is different from verification. Verification serves to ensure that the requirements are stated correctly whereas validation ensures that the right requirement is stated. Verification checks for the quality of the requirement specification, and validation checks if the requirement is useful for the business. Validation is, according to BABOK, to "ensure that all requirements and design align to the business requirements and support the delivery of needed value."

The business analyst has a vital role in justifying that the intended solution actually will satisfy the business needs and resolves the problems that motivated the initiation of the solution. In order to validate requirements, the analyst needs to refer back to the business needs, the problems defined and the future state. There are two main questions or aspects that can be used as a basis for requirement validation (functional and non-functional). These are as follows:

1. Do the requirements bring business value?
2. Do the requirements satisfy stakeholder needs?

Validating a large number of atomic requirements is very difficult and time consuming. It is more feasible to validate groups of requirements. Most requirement elicitation methods include a structured way of documenting the requirements. A set of requirements might be grouped under a capability such as an automated check of orders. It is more feasible to validate these requirements by first validating the capability and then each requirement within that group.

15.5 Business Value

The requirements should express what is to be developed to realize the defined future state. Validating the requirements is therefore very close to validating that the future state will be achieved. Some questions might be helpful in determining this.

1. What assumptions are made for each requirement?
2. Does every requirement add value for the solution (i.e., do they all play a necessary role enabling an automated check of orders)?
3. Are any requirements desirable but not necessary for an automated check of order?

The future state can include metrics expressing the improvements in numbers. In the current state 100 orders can be checked per day by 4 persons. However, for the future state, the need is to have an automated check that enables 1000 orders to be checked and have just 1 person dealing with any defective orders. Ensuring that the requirements satisfy this need is part of the validation. This can be achieved by examining the details of the solution to ensure that there are no bottlenecks, or dependencies that can cause limitations to the number of orders checked.

15.5.1 Stakeholder Needs

Once the requirements are validated in terms of business value, it is important to consider if the stakeholder needs will be satisfied. Different stakeholders might have different interests and perhaps even conflicting views. The same solution might meet a business need that is shared by two or more stakeholders, but each stakeholder might have a different need. Two separate stakeholders might need the automated check of orders but differ in their interest. One might wish to have it to reduce costs by cutting office staff whereas the other might want to increase the number of orders as more sales would take place (sales). Both have a need to increase the number of orders checked but from different perspectives. The solution must not only satisfy the need of the back office but also of the sales department. The back office will have an interest in terms of how incorrect orders are managed and how they can quickly be corrected but sales might focus on the contents of the orders. Validation of requirements is therefore also ensuring that all stakeholders receive a solution that satisfies their particular needs.

15.5.2 Benefit Network Analysis

The analyst should have a good view of which requirements satisfy what need and deliver what value. However, this is not always easy and when such changes happen, it is important that the implication or the effects of these changes should be considered. A tool that might be helpful is a benefit dependency network (henceforth BDN) [140], [157]. BDN was initially constructed to visualize the relation between IT investments and the benefit they hoped to deliver. Although BDN was initially considered for businesses to manage their IT portfolios, it is possible to use it for a specific IT investment. Regardless, in capturing the relation between IT investments and the benefits, there are seven questions BDN aims at answering. They are as follows:

- Why is it important for the company to improve?
- Which improvements are necessary or possible?
- What benefits can be expected (for each stakeholder) and how can the benefits be measured?
- Who is the owner of the benefit that ensures its realization?
- What needs to be changed in the current state to enable the benefit to be achieved?
- Who will be responsible for ensuring the implementation of the changes required that deliver the benefit?
- When (and possibly how) can the identified changes be implemented?

Benefit Dependency Network (BDN) can be helpful to understand the connection between different parts of the project (which includes the requirements) and the expected benefits of the project. BDN is also useful as an overview when discussing changes in requirements with stakeholders. The BDN explicitly connects and depicts the essential IT functionalities that enable a change in the business, which will produce benefits that ultimately achieve the overall investment objectives. The BDN has five components:

- **Objectives** – the end result or the effect that an organization seeks to achieve. It can be "reduced operational costs" or "increased sales volume."
- **Benefits** – the benefits that will lead to achieving the objectives. To reach the objective of "reduce operational costs", the benefits can be "reduced costs from less faulty products" and "higher volume per person managed."
- **Business Changes** – the long-lasting changes introduced to business processes, operations, and practices that will cause the benefits. Normally such changes come once a new solution has been implemented. If a business changes from using an information system to track orders, the changes can only be used once the system has been implemented.
- **Enabling Changes** – the predominantly one-time changes that are made or introduced that are essential for making the changes in the business (business change) such as business process re-designs or implementation of a new customer relationship management system.
- **IT Enablers** – the IT components/solutions/elements that are needed for enabling the changes required.

In building a BDN, the objectives of the investment need and the benefits that the IT investment can deliver must be discussed and agreed upon. These should be clear at this stage of the analysis process. Following this, the "business changes" are identified. This could be new capabilities, new processes, or changes in roles. The prerequisites for making the "business changes" possible, then need to be identified. These are called "enabling changes." This should sound somewhat familiar as they were discussed in "change strategy" and in particular, the gap analysis. Finally, the "IT enablers" are identified. Once these results are captured (see Fig. 15.6), they are illustrated at the far, connected to the objectives (placed at the further most right).

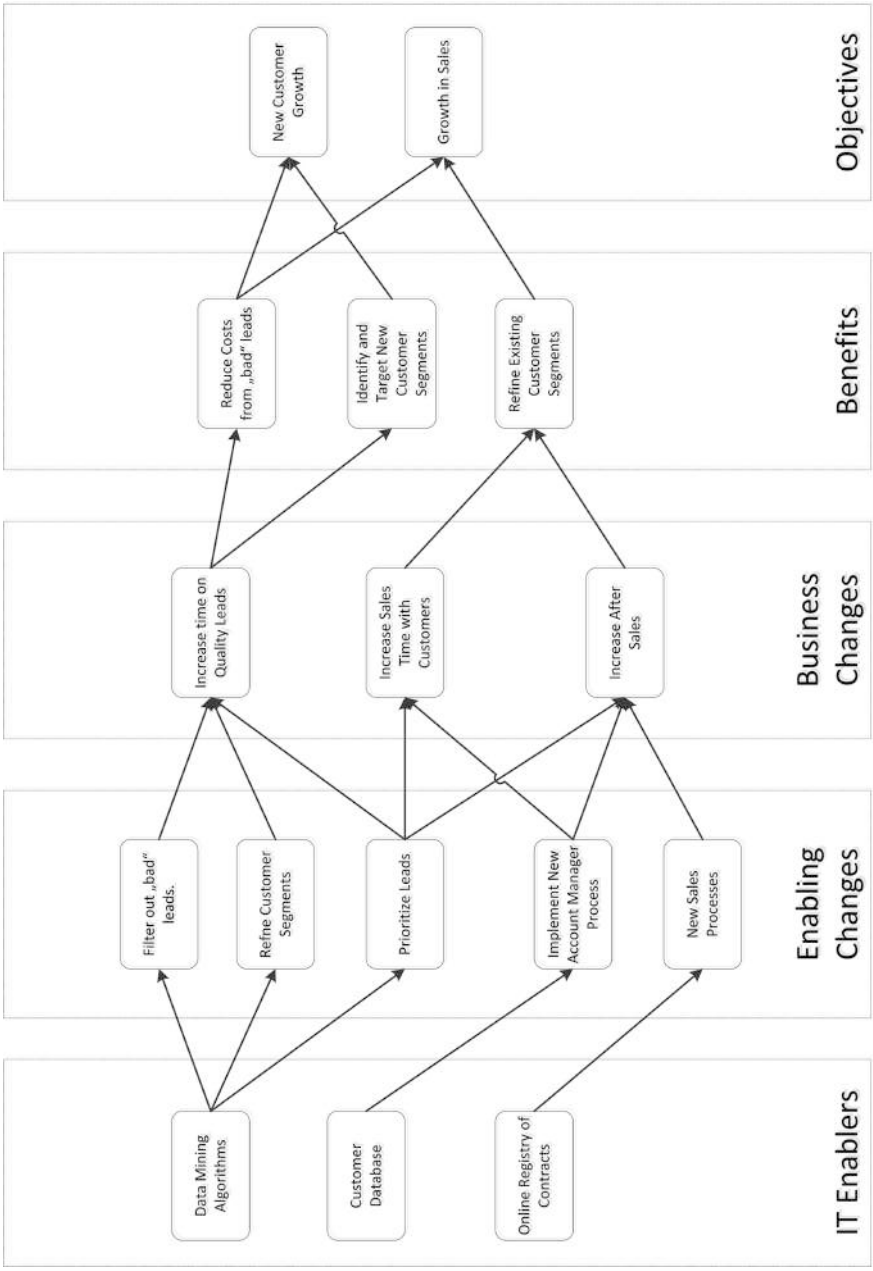

Fig. 15.6 Benefit dependency network

In the simple example in Fig. 15.6, we see that the company seeks two main objectives, namely to grow by getting new customers and by growing existing sales. This is the reason why they seek to make an IT investment. We also see what benefits the project will deliver. One benefit is the reduction of costs associated with spending time on bad leads, and in doing so, failing to pursue good leads. Another benefit is to target new customer segments and lastly, to refine existing customer segments to be able to develop targeted campaigns to achieve better results.

Moving to the other side of the diagram, we see that the main functionalities will be data mining algorithms, a new customer database, and online access to the IT system so sales personnel can work from remote locations when visiting customers. We can also see that online access (registry of contracts) enables new sales processes and data mining algorithms. This together with the new customer database enables better filtering of leads. This enabling change will allow the company to make a more permanent change of increase in the time spent on quality leads, after sales, and existing customers. These changes will in turn, yield the benefits listed above.

As the project is initiated and progresses, more data becomes known and can be used. The new data can be used to enrich and complement the BDN. The BDN depicted in Fig. 15.6 is an illustration and can be modified to fit specific needs. For larger projects, it might be feasible to use several BDN illustrations, one for every major component of the project. BDN can be helpful tracking that objectives are aligned with the business objectives of the IT investment. Furthermore, BDN can help create a common understanding. Such common understanding facilitates agreement among different stakeholders on various aspects. As requirement changes occur, it is essential to make sure that such changes do not limit, hamper or remove the benefits of the solution. By using the BDN, the analyst can "track" and more easily assess how important the requirement is and how it might affect the benefits. Furthermore, a BDN is helpful when discussing the requirement changes with stakeholders as the discussions are focused on benefits rather than specifics of the requirement. If a requirement is modified, a BDN will provide an understanding of how the requirement can be changed to secure delivery of its benefit. Note that the BDM also can include all preparatory work for the receiving business unit that is not part of the project scope.

15.6 Design of Digital Solution

Design of solution used to be much in the hands of business and system analysts. Having gathered the requirements, much of the details were in the way decided by the analysts. As such, solutions were more designed based on practical aspects and perception of the analyst involved. In an increasingly competitive digital era, the focus is much more on what customers and end-users think. The solutions (systems) need not only support the required functionality, they should also be intuitive, attractive, and inviting. This is not only for the looks but also for the use of the

system. A lasting shift towards customer-centric design has begun. As such, the perspective, opinions, perceptions, and input of customers and end-users are more important than ever before. Here we briefly examine a few simple and digital based methods that allow an analyst to incorporate end-user inputs.

15.6.1 Surveys

Surveys can be successfully used to gather and confirm requirements. Workshops and interviews are very valuable to get in-depth understanding of requirements but only from selected stakeholders. Surveys, on the other hand, allow gathering data from a much larger population. Surveys can be used to gather requirements, gauge end-user sentiments and perceptions, or to confirm already elicited requirements. Online survey tools provide the functionalities required for design and analysis, allowing the analyst to focus on the questions. Key to gathering information via surveys is to ask focused questions. Surveys are best when topic-specific [169]. Surveys that encompass many aspects run the risk for being too large and fail to keep the focus of respondent. For instance, if a project has several aspects such as functionality, interface, and non-functional requirements, it would be better, if needed, to have separate surveys for each area. The questions will depend on the stage of the design development. For example, it is not useful to ask "which functionalities should the system have" when in late design stage. Such input should have already been covered earlier. At such a late stage, it would be more effective to ask specific features of the functionalities. Note that surveys can be used earlier but the purpose and questions will vary. For instance, at an earlier stage, it might be very helpful to ask of what functionalities users require or about how well certain functionalities are supported. Surveys are commonly used to gather information from a large number of people, hence the data will be best analyzed with quantitative methods. To facilitate such analysis, it is better to have multiple choice rather than open-ended questions.

15.6.2 A/B Testing

A/B testing is a popular tool for making data-driven decisions in design process [170]. A/B testing simply means comparing two or more versions of a solution in order to find out which version performs better according to a set objective [171]. It is mostly used in web and application development. An A/B test would commonly randomly direct half of the visitors to one version of the solution or design while the other half will see the other version. The version that results in better performance according to set criteria, is selected [172]. For example, half of the users of an ecommerce site are directed to a single-page checkout and the other half to multi-page checkout and whichever version has more completed orders is adopted

[173]. A/B testing allows us to objectively evaluate and based on facts, select the better version.

Planning A/B testing has two key steps. The first is to specifying what to test and the second is to define a relevant metric to measure the performance [171]. Usually, the scope of what is being tested is narrow such as a specific part of the user interface like the layout or the color scheme. The focus does not need to be that narrow but having too many differences between the versions, makes it difficult to assess exactly what aspects lead to better performance. The difficulties in finding a good and precise measure increases significantly when more variables are in play. For instance, if the style of buttons used are being evaluated, it is simple to deduce which style is more preferred. One can measure it by the number of clicks. However, if the two versions differ in regard to several variables, then it is difficult to know if the higher number of clicks for one version was because of the button style or some other variable. The aim is to find the solution that delivers best value over longer period of time, but the focus is on measuring short term impact. For instance, using profitability is not useful because it cannot be measured immediately. While important, it takes time to truly assess the impact of a version on profitability. A/B testing cycles are not long enough to allow for certainty in regard to correlation to profitability. As such, metrics need to be measured immediately. Rather than profitability, it is more effective to use clicks, views, time spent on completing the task, and other more easily and immediately measurable metrics. These metrics work as a proxy for longer term value such as profitability [172].

A/B testing is commonly better in agile development environments [172]. In agile, solutions are developed and tested in smaller parts, allowing for more flexibility and adaptability. However, A/B testing is also frequently used in the continued management of a software product as an important part in its incremental improvement.

A/B testing requires a structured approach as it is a controlled experiment. Similar to surveys, A/B testing requires careful design to ensure unbiased and high-quality data for analysis. In addition to deciding on what to test and how to measure it, aspects such as size and segment need to be carefully considered. For instance, if a test is made on both the mobile app and the web application, it is important to run the tests separately. Mixing the results, measured as for instance number of clicks, will be misleading as users commonly click less when using a touch screen [171]. Furthermore, it might be useful to gather additional metrics that can give increased insight about other performance aspects. For instance, it might be valuable to look at the time it takes from the user getting to the loading page until he or she makes the first click. This time delay can give hints as to the degree of intuitiveness of the user interface. One should be careful not to gather too much data. In the digital era, data comes easy but not all data is relevant nor is it easy to analyze increasingly larger sets of data.

Once the A/B testing has been conducted and data gathered, it is time for analysis. Naturally, the analysis process already begins during the planning to ensure that correct data can and is collected. The analysis is oftentimes done by hypothesis testing. In short, using statistical methods such as t-test, the data

gathered on the two versions are analyzed to see if one version showed significant higher results in regard to the metric defined. Let's consider the previous example of a button style. The metric used is number of clicks and we have two versions, A and B. Let us assume that A got more clicks. This is not enough to conclude that A is better. We need to ensure that this was not due to randomness and the higher number of clicks was not due to the button style. To assess this, statistical methods are used to determine if the results are significantly different for the two versions. As such, A/B testing requires in understanding of statistical analysis.

15.6.3 Prototypes

If users can see something that shows how the new solution will work, they can give better feedback. Prototypes serve this very purpose and have become more common in the design of a solution. The prototype of products can be in different forms. Physical products can be shown as drawn sketches or physical 3D built out of cardboard or Lego bricks. Processes could be enacted by means of role plays or storyboards. Software can be tested out on paper or using mockup tools, or even building a simple and low cost version of the solution from scratch. [174]. The main idea is to give the users some form of a tangible idea of the direction of the solution.

When building a prototype, it is important to agree on what parts of the solution will be sketched out. It could be features, functionalities or visual appearance including or excluding interactive parts. The prototype should only include the most important parts. For example, when designing a webpage, it is perhaps sufficient to use a set of still images. There is no need to include interactive elements such as clicks, and hovering. The end users will be able to provide feedback based on what they see and can imagine how the clicks and hoovering parts would be.

Based on the prototype, the users can provide relevant and valuable feedback. Getting it right at the design stage is cheaper than after deployment. It is simply cheaper to redo a prototype as compared to an implemented solution. If a website is shown as images, the users can give quite detailed feedback on the appearance. Incorporating such changes is quite easy and cheap as it's only images and nothing has been built yet. However, if the developer presents a fully built website to the user, it will be more time-consuming to implement changes based on feedback. Commonly, users do not appreciate how much work and lines of code changes require. As such, they might request several changes, or even ask for one thing, then another, and finally back to the original one. As such, it is better to explore the solution while on paper until it is "ready" and then begin with the coding. It might also happen that one prototype is not enough but several versions will be required [175]. Therefore, it is better to start with low-fi prototypes, such as sketches and mock-ups, and gradually move forward to more details once the rough drafts are accepted and agreed upon.

15.7 Non-functional Requirements

We have discussed the designing of alternative solutions above, but we have exclusively considered functional requirements. Most cases also require a closer examination of non-functional requirements as well. Non-functional requirements [162], [163], on the other hand, look at how well the functional requirements should perform. A solution might have a set of functional requirements stating how a new application is to be processed, what data fields are to be completed, which of these are mandatory and which are optional, how the solution should behave if wrong data is entered and so on. However, such requirements are not telling us how well the system should perform such as the system must be available and running 98% of the time. The solution might hold sensitive data so there might be non-functional requirements stating the level of security. Non-functional requirements are characteristics a system must have, not what it should do.

There are some different categorizations frameworks for non-functional requirements and while each have their specific approach, most list a core set of categories. One of the categorizations split the non-functional requirements into three main categories, product, organizational, and external. Each is then decomposed further as shown in Fig. 15.7.

The most common categories of non-functional requirements are as follows:

- **Availability** - stating requirements on the time the system is expected to be available for use.
- **Maintainability** - expressing the requirements regarding level of ease by which components can be changed, replaced, removed, or adapted to other systems.
- **Reliability** - defining how much the system is expected to be up and running without disruptions. Reliability is often expressed as the mean time between failures or ratio of down time to availability.
- **Performance** - stating the volume, speed or another criterion expressing how well the system must perform. It can be expressed as the speed by which something must be completed or the capacity the system must manage at peak time.
- **Security** - expressing aspects concerning protection against intentional or accidental unauthorized access, usage, changes, or disclosures.

The above list is not complete but details the most common examples and occurring non-functional requirements. The analyst might find it challenging collecting information on how to measure non-functional requirements. It is all too easy to express a non-functional requirement in vague terms. Performance might be expressed as “the system must be able to manage the load at peak-times.” This is vague and does not help developers, nor does it help the analyst to assess whether the requirement has been fulfilled. Rather, it must be made more quantifiable. For instance, if the record peak was 100,000 transactions, the statement “the system must be able to manage 120,000 transactions per day” would be better. However, this might also be misleading. If the peak is evenly spread over one day, then the above

Fig. 15.7 Categories of non-functional requirements (simplification based on [49])

statement is in order. However, if it happens that most of the transactions come within a few minutes and the rest are evenly distributed over the day, then the statement is misleading. In fact, the system might be able to manage 120,000 transactions per day but could break down on a day when the total transactions were only 50,000. In such a case, the statement, "the system must be able to manage 60,000 transactions within 20 min" is more appropriate. In defining non-functional requirements, the analyst is required to have some foundational data to understand what is expected of the system and establish the non-functional requirements accordingly.

15.8 Define Design Options and Recommend Solution

There are usually alternative ways of solving a problem or fulfilling a requirement. If an analyst goes with the first one that comes to mind, there is a risk of overlooking a better design. The idea of defining design options is therefore to see what

options there are and then choose. When the solution starts to evolve, many aspects surface and different ways to achieve the goals emerge. However, each alternative will have its benefits, strengths, advantages, and disadvantages. Contrasting these options with each other, allows for a better choice.

Once the alternatives are identified, they can be analyzed. It is worth bearing in mind that these alternatives are not elicited as a separate activity. Quite often, more information is gathered, and the matter discussed; one or two main alternatives emerge as the most feasible options. Deciding between these is quite straightforward but occasionally the trade-off is significant enough to merit further discussions. Besides the actual designs, it is important to consider the expected costs, benefits, and risks of the alternatives. The cost manifests itself as possible delays to the timeline, efforts required, operating and maintenance costs, external costs (if purchases are required), physical, human, or informational resources required. The value on the other hand, is perhaps more difficult to estimate. However, care should be taken not to equate value versus potential value. While potential value can be important, it is an uncertain value and as such, should be given less emphasis as compared to actual value that will be realized.

Consider the following example. Within a project, two functions are merged into one IT system and will require customer data registration. Two departments are involved. Department A registers the main information. However, this department has not been consistent, and the data is full of "bad" customer registrations. Now department B will also have to enrich the customer with detailed and verified data. Both departments will have to have access to the same customer data entry menu. For the project, there is an option to move all the responsibility of registering customers to department B. This would perhaps be the "cleanest" solution. However, not wishing to inherit a customer database full of "bad" data, they don't agree to such a solution. An option is to first clean the database but that would take too much time. A third alternative is to divide the menu into two parts, one for department A and one for B. Each will have their own access and continue to work as before but in the same system. These are design options. The choice made was not the best but, considering different aspects, the most feasible.

When recommending an alternative, the best one is not always the one to move forward with. Before making the final recommendation, it is important to consider the available resources. If there are any limitations in resources that affect the ability to implement a specific alternative, these should be taken into consideration. Furthermore, a holistic perspective must be considered. It might happen that several alternatives do not bring much value but are required for delivering another vital functionality. As such, the dependencies to other parts might matter when recommending an alternative.

As with verification and validation, these aspects are not one-off events but take place alongside the work. Stakeholders are vital in this process, but the analyst can eliminate alternatives that are out of scope, unreasonable, or contradicting other important aspects. In this way, the decision is made easier.

Chapter 16
Requirement Elicitation Using Business Process Models

In organizations, process models are used to facilitate communication between various stakeholders, to understand how work is being performed and where improvements can be made. Such process models are valuable sources of information for requirements elicitation. In fact, these models are not only used to understand the environment but are increasingly becoming an important part of the requirements specification process. Business process models, while being widely used, are rarely utilized as the main artifact when discussing requirement with domain experts. In the following sub sections a systematic method of eliciting requirements from business people is presented by using process models as common artifacts. The method assumes that the to-be business process has been modeled and can be used as basis for the elicitation. The method provides a template, which includes the data needed for a requirement, and a set of questions that will guide the elicitation of requirements in collaborative discussions, based on business process models, with the domain experts. For each relevant activity, questions are asked of the domain experts that allow for eliciting the intended requirement[1] [158].

16.1 Elicitation Process

A template is used to document the requirements. The template shows every relevant activity of the process model. This means that in principle, for each activity of the process, there is one main requirement. The template covers all aspects that constitute a complete requirement. The template is designed to ask a set of pre-defined questions from the domain experts while using the business process model as the main artifact.

[1]This section is based on a previously published paper by the author [158]

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The process of populating the requirement specification is practically achieved by eliciting information about the goal, actor, trigger, operational steps, alternative paths, failure conditions and their management for each relevant activity (see Fig. 16.1). The information required is elicited by applying a set of questions that are designed to capture that specific information from the domain experts using business process models as common artifact. As such, the requirement specification template is gradually defined until it forms a complete specification. The process is then repeated for each activity of the business process that is relevant.

The extent to which the domain experts are engaged depends on the level of detail in the business process models. If the process models have been modeled in great detail, most of the information has already been captured. In such cases, the input of the domain experts is of a more confirmatory nature. However, if the models are not at a detailed level, "hidden" requirements are elicited from the domain experts. If the model lacks artifacts, the elicitation will inquire about the objects and capture, through the questions, the information from the domain experts. By the same principle, incomplete models can be made complete by adding the lacking parts to the model.

Activities are the focal point of the method. Each requirement specification corresponds to at least one activity. The requirement specification (see Table 16.1) consists of two columns, where the first one states what data is to be captured in the second column of each row. The data required are "id" (a unique id for the requirement specification), "business process" (name of the process model in which the main activity of the requirement specification belongs), "activity" (the name of the focal activity that is the object of requirement elicitation), "goal" (the expected outcome of the activity), "actor" (the performer of the activity), "trigger" (what initiates the actor to perform the activity), "procedures of the activity" (the operational steps taken to perform the activity, both desired steps and alternative steps required when the desired steps cannot be executed), and "failure conditions and handling" (cases where the activity cannot be executed or interrupted in its execution and actions to handle the failures). The requirement specification template inspired by the use case specification of Cockburn [149], covers all components necessary for a requirement as aligned with their corresponding business process model elements.

16.1.1 Step 1 – Determine Relevant Activities

The first step is to determine if the activity is relevant or not. An activity is considered relevant if it requires some form of functionality support from an information system. If the activity is performed manually and does not require any support from any semi-automated or automated system, it is not relevant. As such, to be considered or developed, a specification is only elicited for activities that require some sort of support.

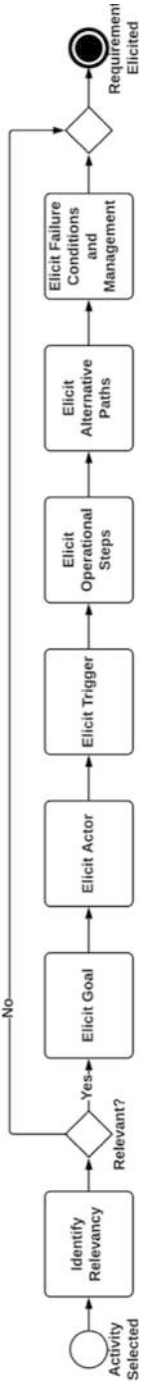

Fig. 16.1 Requirement elicitation process

Table 16.1 Requirement specification template

Requirement specification	
ID	
Business process	
Activity	
Goal	
Actor	
Trigger	
Steps of activity (positive scenario)	Operational steps
	Alternative paths
Failure conditions and management	

A requirement specification is populated for each activity. However, in some cases, several activities are so connected that they should be treated as one from the perspective of requirement specification. To determine if two or more adjacent activities should be included in one requirement specification, Cockburn asks the following questions: (1) Are the consecutive activities executed by one person, in one place and at the same time? (2) Would the activity be disrupted, or would it be problematic if a break was taken between the activities (such as a lunch break)? If the answers to both questions are "yes", the execution of the activities are tightly connected and there is no reasonable reason to separate them. They should therefore be treated as one requirement for the system being built.

16.1.2 Step 2 – Identify Relevancy of Activity

The second step is to determine if the activity is relevant. If the activity requires some form of system support, there is a need for having its functional requirements specified. In order to determine the relevancy of the activity, the following questions are asked:

- Does the execution of the activity require any support from any computer-based system?
- Is the system under construction to be involved by providing, executing or receiving data during the execution of the activity?
- Are there any connections to external systems involved in the execution of the activity that need to be considered for interfacing with the system under construction?

16.1.3 Step 3 – Elicitation of Goal

An executed activity serves to fulfill a certain predefined outcome or goal. In this step, the outcome of the activity is elicited by asking the following questions:

- What changes after the activity has been executed?
- What is required to be achieved or accomplished with the execution of the activity?
- What form and/or format are the results in?

16.1.4 Step 4 – Elicitation of Actor

In this step, the executor of the activity is elicited. The actor can be either human such as a role, department or organizational unit or a non-human resource such as an information system. The actors are elicited by asking the following question:

- Who are the actors, human and non-human, who are involved in the execution of the activity?

16.1.5 Step 5 – Elicitation of Trigger

Triggers determine when an activity is to be executed. Activities are generally triggered by either an actor receiving a message, a specific predefined time or by the end of a preceding activity. The following questions assist in eliciting the triggers:

- How does the actor (human or non-human) know when to start the execution of an activity?
- If it is a message, what kind of message is it and how does the actor become aware of receipt of the message?
- If the activity is a time dependent event, how is the actor notified about when to start the execution of the activity?

If it is complete execution of the preceding activity that is the trigger, is the actor responsible for the execution of the preceding activity and if not, how is the actor informed about it?

16.1.6 Step 6 – Elicitation of Operational Steps

An activity usually consists of procedural or operational steps, i.e. the individual steps that need to be carried out in order to execute the activity. In this step, the preferred or desired operational steps are elicited by asking the following questions:

- What are the operational steps required for the execution of the activity?
- Who performs the operational steps?

- What tools or aids does the actor engage or use in carrying out the operational steps (such as human or non-human actors, internal or external systems)
- How are these tools or aids used?
- Are verifications required to carry out the operational steps?

16.1.7 Step 7 – Elicitation of Alternative Paths

Alongside the standard set of operational steps, there are alternative paths taken when the standard cannot be executed. This could be entering an order when the customer is not registered, and an alternative path is required before the order can be registered. These alternative paths are elicited by asking the following questions:

- Are there cases (when carrying out the standard operation steps) where additional or alternative steps need to be taken in order to reach the goal of the activity?
- What are the conditions of these cases?
- What complementary or replacing steps need to take place in such cases?

16.1.8 Step 8 – Elicitation of Failure Conditions and Failure Management

Activities cannot always be successfully executed and reach their goal as they might be interrupted or disrupted. In this step, such conditions that hinder an activity from being initiated, interrupted or disrupted are elicited. Furthermore, such failure situations require additional steps to be taken in order to solve the disruption. These failures and steps to manage them are elicited with the aid of the following questions:

- What can hinder the initiation of an activity?
- What can cause to interrupt or disrupt an activity?
- What activities or steps are needed to limit the loss, handle or resolve issues so an activity can be initiated?

16.2 Example of Check and Update Order Confirmation

Table 16.2 illustrates an example of a populated requirement specification. In the first step, the activity, “check and update order confirmation” was determined as relevant because it requires some interaction with a system support (not a purely manual task). Then, the goal of the activity is elicited (step 3). With the aid of the

Table 16.2 Example of a populated requirement specification

Component	Description
ID	003
Business process	Supply chain security (purchase)
Activity	Check and update order confirmation
Goal	Updated order (suggested delivery date and order status updated)
Primary actor	Purchase department
Trigger	Order confirmation received by email
Steps of activity (positive scenario)	Operational steps
	1. Open PDF format order confirmation received by email 2. Find the relevant purchase order 3. Check that ordered materials are the same as on the order 4. Enter suggested delivery date and change the status to "Confirmed" 5. Reply to the email confirming the order confirmation 6. Save the order
	Alternative paths
	1. If order confirmation differs from the order (e.g. quantity smaller than ordered), contact the person who created the order and ask for advice; if changes OK follow the normal flow 2. If suggested delivery date is later than the required delivery date, take same actions as in alternative path 1
Failure conditions and management	1. If order confirmation differs from the order and is not acceptable, the order will be deleted, and the process will be interrupted

questions, it becomes clear that the goal of this activity is to achieve an updated order. After this, the actor is determined (step 4) which is someone from the purchasing department. The next set of questions aims at eliciting the trigger of the activity (step 5). In this case, a message event preceded the activity indicating that an incoming message from the supplier is the trigger. This is further clarified (with the aid of the questions) that the trigger is an email with an attachment from the supplier. Further discussion reveals that there is no need for any automation or an interface. Next, the operational step of the activity is elicited (step 6). By using the questions, the operational steps are elicited and clarified. Some steps, such as the second step, "find the relevant purchase order", are elaborated to the parameters used to find an order. Following the operational steps, the alternative paths (step 7) are elicited. The discussions based on the questions of the method, reveals that two alternative paths exist, one, when the confirmation differs from the order and two, when the suggested delivery date is later than the customer needs the goods. The final step of the method (step 8) is eliciting failure conditions and management. In this step, situations that prevent the activity from starting or that interrupt/disrupt the activity and the measures that need to be taken are discussed. Failures are connected with the operational steps and alternative paths. For instance, the

alternative path of an order confirmation differs from the order and it is not acceptable. Clearly in this situation the management decision, is to delete the order and interrupt the process.

16.3 Robotic Process Automation

Having analyzed and elicited requirements from process models, it is possible to consider if manual work can be automated. Robotic Process Automation (RPA) tools are used to automate processes, where humans interact with systems and programs. RPA tools learn to mimic user actions in user interfaces. RPA programs are layered on top of existing systems, doing exactly what employees used to do, even actions like logging in and out of the systems [159]. It is like an Excel macro where one can record a number of operations and then have the macro repeat. Traditional automation requires changes to the IT systems. However, RPA does not require existing systems to be changed. Furthermore, RPA can work with several programs, transferring and modifying data [34], by for example taking an email with an employee's timesheet as an input and entering it to the payroll system.

RPA can be and is often integrated with machine learning. Even so, RPA programs are restricted with business rules and do not take independent decisions when encountering unknown situations. In such cases, the issue is redirected to a human agent but observing how the issue is solved [34]. Given the ability of RPA to automate manual tasks, the main benefit lies in cost reductions, in particular for back office processes such as handling administrative data and repetitive tasks [160]. Certain tasks such as routine tasks, such as client profile updates or delivery notifications, can be executed by robots far faster and cheaper than by people. Hence, such tasks are perfect candidates for RPA. However, not all back-office processes can nor should be assigned to robots. First of all, the tasks to be automated by means of RPA should be of sufficiently high volume. Automating, because low volume processes will not significantly reduce costs but will incur costs for setting up RPA. Such an investment will not be cost efficient [161]. Secondly, all processes cannot be automated with RPA. Candidate processes should be standardized and rule based [160].

Although RPA tools learn task execution directly from users, there must be a clear pattern that the program can learn. RPA can even be used for complex processes as long as the complexity lies in higher number of variables to consider and execution steps [161]. On the same note, RPA is not helpful if the process requires creative thinking or problem solving on a case by case situation. Such cases lack clear patterns that the RPA tools can mimic. Likewise, candidate processes should have as few rare and exceptional cases as possible. If the cases do not have set rules defining how to solve it, they cannot be managed by RPA [34]. As can be seen, an investment in RPA requires the presence of enough suitable processes that can be automated in order for the investment to deliver value that outweighs the costs.

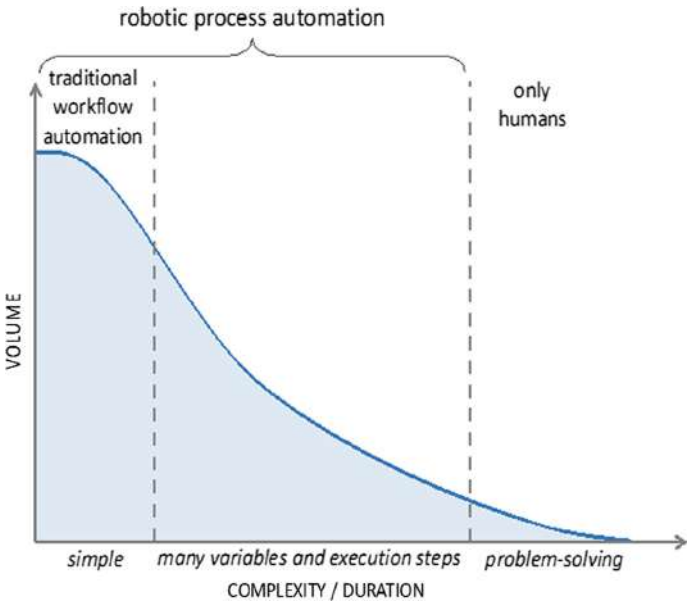

Fig. 16.2 Candidate processes for automation using robotic process automation based on [34]

Figure 16.2 illustrates a way of identifying RPA candidates. The y-axis shows how many times a candidate process is executed while the x-axis depicts the complexity of the process. Complexity can be assessed in different ways such as in this case, the duration of the process. The logic is that the more complex a process (execution steps), the longer it will take a human to complete the process. Most processes, such as registering a purchase order, would take shorter time to execute. On the other hand, complex ones such as problem-solving tasks, require perhaps extra analysis and meetings, and as such, take longer time to complete. Very simple tasks occurring most frequently are commonly already automated. RPA can assist with automating the next band of processes but not the very complex ones.

Mobile telecommunications companies have back office processes that are good candidates for RPA. A British mobile telecommunications company is a pioneering example of RPA application [161]. Rapid growth in volumes of offshore transactions necessitated cost reductions. In addition to removing non-value adding processes and process optimization, the company applied RPA. Initially, high-volume and low complex processes such as SIM swapping (changing the customer's SIM, but keeping the number) and credit checks (pre-calculated credit on customer account) were automated with RPA [161]. Following successful implementation and value, other processes were examined. The selection criteria used to find processes were volume (more than 1000 transactions/week) and complexity (completion time over 30 minutes). In the end, the company automated over 35% of their back office processes, resulting in half a million transactions per month being executed automatically [161].

Chapter 17
Vendor Assessment

Many projects investigate implementing software solutions to support the business. When information system development became commonplace, larger companies built their own software solutions, many of which are still in use. However, today it is almost the rule to investigate alternative solutions offered by vendors who sell commercial off-the-shelf (COTS) software solutions. Furthermore, Software as a Solution (SaaS) has gained popularity and is the preferred choice for many SME companies. It does not necessarily have to be the complete system, it could also involve solution components or outsourcing parts of the operations. As such, whenever a new system solution is being considered, the business analyst needs to consider SaaS or off-the-shelf systems.

The digital business analyst should consider vendor assessment as an important method. The old way was for companies to build their own IT systems as there were no ready-made packages. Not long after, some companies offered standard solutions that could be customized and installed in-house. This is no longer the case with digital technologies. We see companies specializing on certain types of digital products. These products evolve at a rapid pace, far faster than what companies could cope with if they built it themselves. For instance, if a telecom company wishes to reduce costs by implementing a chatbot solution, it would be extremely expensive for them to build it themselves. Not only will they lack the skills, but it would be very resource consuming to maintain such solutions as they need to be improved but also, to build upon it to take it to the next level. It is far more efficient to buy the solution from a specialized company. As such, we see that for digital technologies, it is better to buy in or partner up with companies rather than build it. In this regard, vendor assessment becomes important.

The main objective of vendor assessment is to examine the suitability of the software solution to the needs and requirements of the company [164–166]. However, vendor assessment does not only concern the solution but also the actual vendor. The financial stability of the vendor, their capability to maintain competence and development resources, ability to respond to issues and disruptions, their

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principal solutions and ability to satisfy non-functional requirements such as data storage are also aspects to consider.

17.1 Vendor Assessment Process

The analyst can choose many different ways to perform the task of assessing a vendor provided solution. Vendors are usually quite flexible and often adopt the philosophy of "the customer is always right". Regardless of the method and the flexibility given to the customers, there are some main steps that are worth considering when engaging in a vendor assessment process (Fig. 17.1).

17.1.1 Need and Scope

The first step in vendor assessment is the need for clarity of the scope. By this time, the analyst has defined the scope of the change and even started discussing parts of the strategy analysis. However, when working with vendors, it is important to be clear as to what is expected from their software solution. At this stage, it does not need to be at a very detailed level, but the scope should be defined in terms of products, processes, and functionalities. Vendor assessment is a time-consuming process and it is important to do it properly. Failure to do so can prove costly.

Let us consider a company that needs to have a solution in place and is on a tight time schedule. Due to this, the analyst might not have properly defined the list of products, processes, and functionalities. Rather, they have relied on the information given by the vendor and moved forward with installing the system. Once the system is in place and the company has become dependent on the vendor, and additional products are being migrated to the new system, it might be that the software does not fully support all products or functionalities. At this stage, it is very costly to do something about it. Either further development is required, or the company is "stuck" with an old system and processes for a few products. Evaluating several vendors concurrently is time consuming. To save time it is better to shorten the list

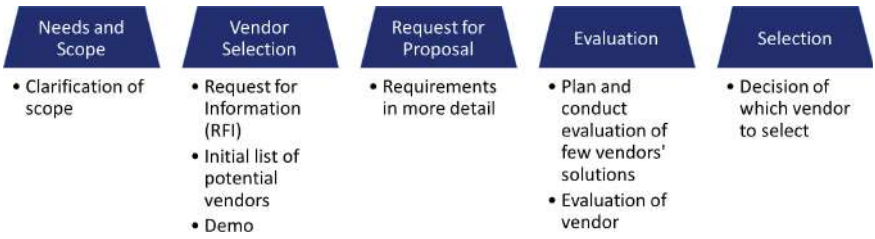

Fig. 17.1 The Vendor Assessment process

of potential vendors to perhaps two or three alternatives. One of the ways to shorten the list of vendors is to have a clear understanding of what products or services, processes, and functionalities the new system covers. The scope does not need to be detailed but clear enough to allow for reducing the list of potential vendors. In other words, the scope functions as an exclusion criterion or "knock-out" filter for the purpose of reducing the list.

17.1.2 Vendor Selection

Once the scope is clear and agreed by the key stakeholders, the analyst can begin finding potential vendors. The Internet is perhaps the main source of information to find vendors. However, it is also possible to attend conferences or industry events where vendors are represented. If such events are available, it is better as the analyst can discuss with the vendors and quickly assess if their solution fulfils the scope criteria. At this stage, the analyst requires more information from the vendor about their solution. As such, a "request for information" (RFI) can be put together and sent to the vendors. An RFI serves the purpose of gathering information about the vendor solution for the purpose of assessing if the solution is suitable considering the scope. Once the information is gathered, some vendors can be crossed off the list.

Following this step, the list might still be too long. The analyst can invite the vendor to demonstrate the product. At the demo, there are opportunities to discuss more about the background, the need, and the scope of the project. The vendor can show their solution and answer questions about the product/service coverage, processes, and functionalities. A demo does not provide enough information to make a decision but can aid in determining if the solution is still interesting or if it should be ignored. At these demos the vendor talks about their company, its history, development of the solution, and refers to other clients who have used their system).

17.1.3 Request for Proposal

Request for proposal and evaluation does not have a specific sequential order. The request for proposal (RFP) can be sent before the evaluation but also after the requirements have been detailed (for the evaluation). It will depend. The main objective of the vendor assessment process is to successively reduce the number of vendors until one is selected. If there are many vendors on the list at this stage of the process, it would be wise to send an RFP to them in order to gather more information for filtering. However, if there are two or more vendors it is better to prepare the requirements in more detail and include them in the RFP. An RFP is a document that presents the needs of the company and asks the vendor about their

proposal on how to solve the issue. There is no set standard for what an RFP should include but the most common elements are as follows:

- Cover letter
- Clarification of the purpose of the project
- Background of the company and the project
- Scope of the project
- Requirements (to the level of detail as has been prepared)
- Evaluation process and criteria
- Time schedule (different steps of the evaluation, project, and deadline for response)
- Terms and conditions (legal aspects)

An RFP document can include the requirements if they are prepared. Generally, it is better to include the requirements if they are prepared. One should remember that the aim is to gather enough information to shorten the list. If vendors are provided with good data, they can prepare better responses. It should be noted that companies are not bound by regulation in the same manner as governmental agencies are. Therefore, the RFP created by companies vary more in regard to content, level of details, and what they expect the vendor to do. Government agencies will have specific templates and procedures for when and how RFPs are to be prepared and sent out.

17.1.4 Evaluation

At this stage, the list of potential vendors should be no more than three, perhaps even only two. More will make the assessment unnecessarily expensive. At this point, the aim is to evaluate the vendors and their solutions. The evaluation should be of such detail that it highlights the most suitable vendor to be chosen. This part is perhaps the most time consuming as the analyst needs to gather the requirements.

The evaluation requires a more detailed description of the requirements and some form of response from the vendor as to how they can fulfill these requirements. The analyst is involved in eliciting the requirements and preparing a "request for proposal" (RFP). An RFP is essential when the need and scope is clear, the requirements are mostly known but the actual solution is not known. The vendor can, as a response to the RFP, describe and propose how they can solve the problem and fulfill the requirements with their standard solution.

17.1.4.1 Preparing a Systematic Evaluation Basis

There is a difference between detailing requirements for assessing standard solutions and building software. When building software, the requirements need also to

consider how the functionality is to be supported. For instance, when designing a solution for customer registration, the design will include every field entered and also, how the registration process should work. However, when assessing standard solutions, such details about the design are not required. It is sufficient to say "customer registration" is a requirement and evaluate how the standard solution provides this functionality. Remember that by deciding to buy a standard system, one agrees to adopt the fundamental standard processes it offers.

The evaluation, which often is conducted via workshops, aims at investigating how the requirements are fulfilled, what is lacking, and what other functionalities are available that can be of benefit. However, the basis for these workshops must be prepared and analysts are oftentimes involved (or responsible) for this task. The evaluation has three main steps, the first is to elicit the requirements for the evaluation of the standard system, the second is to hold the actual workshops and lastly to compare the alternatives.

When eliciting requirements, there is a trade-off between "level of detail" and "cost/time." The analyst can detail the requirements to ensure a proper evaluation but at a high cost. On the other hand, keeping it at a general level can cause the evaluation to be weak resulting in the risk of selecting the "wrong" alternative. There should be a balanced trade-off. A good trade-off is to elicit the requirements at a level of detail that would allow the evaluation to be conducted (in workshops) over 2–3 days (given that there are 2–3 alternative solutions). Naturally, the same set of requirements will be used for the evaluation of all standard solutions.

For all solutions, there are key areas that are important to achieve the desired impact. This is also true for vendor provided solutions. Therefore, the requirements prepared should focus more on the identified key areas and investigate these areas in more detail. Standard functionalities such as customer registration do not need to be detailed when evaluating a solution. Very little time should be spent on showing the kind of data that can be registered, and the overall process of customer registration, amendment, or deletion. However, if the functionality for managing exceptions in the flow is a key area, it might be wise to spend more time evaluating this functionality. In such a case, it is helpful to spend several hours on this functionality.

When evaluating a standard solution, it is very rewarding to see examples that the domain experts and users are familiar with. When vendors show their systems, they usually show examples that are well suited to their system. However, that does not necessarily apply for all companies. One way to address this is to prepare examples from "real-life." When preparing and selecting cases, it is important to make them as varied as possible and keep numbers low. The idea is to evaluate a system (how it fulfils the requirements) by using real examples that:

- Users know, understand, and are familiar with
- Can relate to when evaluating solutions, and
- Is representative of what users feel to be important

Examples of real cases can vary and should reflect what is being evaluated (requirements). As such, it will vary from project to project. The examples, listed below, should collectively cover all the requirements:

- Odd cases that occur but not very often
- Users currently have problems with
- Common errors or when things are missing
- One or two really odd cases

It is better to use real data for examples rather than making up examples. If there are problems with confidentiality, the data can be anonymized. For certain cases, it might be valuable to evaluate the end results (outputs) as well. For instance, if the system has to produce certain reports, confirmations or make calculations, the corresponding output can be taken to form the real case and used for verification during the evaluation. When selecting examples, one should bear in mind that evaluating a new system has enough "new" information. Therefore, it is better to keep the data regarding the customer, various counterparties, transactions, contracts, cases, orders, static data and so on at a familiar level.

Once the requirements and the examples are selected, it is appropriate to have a meeting with the vendors. In a preparatory meeting, the agenda for the evaluation workshops can be discussed and agreed. Furthermore, the vendors are presented with the requirements and the examples. They are also given all the static data and information about the set up required for the examples to run. This is an important part of the evaluation as the workshop is only for a few days and should be used as effectively as possible. Therefore, working with a set up or entering static data required for running examples at the workshop is a waste of time. This should be done prior to the workshop in order to focus the evaluation on the functionalities of the systems. In short, a prepared vendor allows for better evaluation. The preparation meeting serves to:

- Show them the process models
- Show them the requirements
- Provide them with examples
- Provide them with the static data needed to run the examples
- Discuss the structure of the workshop

Having had the preparatory meeting, it is important to give the vendor ample time to properly prepare themselves and their system. At this time the analyst can continue working with preparing the evaluation forms that will be used during the evaluation workshops.

There are two main ways of structuring the evaluation when using real examples. The first is to take each example from the beginning to the end. This approach is appropriate in certain cases but can also become very repetitive. For instance, consider a company that wishes to evaluate a task management system. If taken case by case, beginning with customer registration, they will soon find themselves repeating the customer registration for each case.

The other approach is to focus on each main step of the functionality process. For instance, in the example above, the company could evaluate "customer registration" and examine this functionality or sub-process for all relevant cases. Following this approach allows for a more focused and efficient evaluation, covers many aspects of the one main functionality, and avoids repetition.

While there are no set templates for creating evaluation forms, it is important to keep them simple and understandable (example illustrated in Table 17.1). The forms are to facilitate and support evaluation, not to become an overly complex document that requires time to work with. However, such forms should include the following columns:

- A number id that allows for tractability to the main requirement being evaluated
- The requirement or functionality being evaluated, preferably expressed as a question. For instance, rather than stating "order creation" or "invoice re-creation", it is better to express it as "how are new orders created?" or "how can I recreate a copy of a sent invoice?"
- A field for comments should also be included
- Rating – a column for rating how well the system fulfils or manages the functionality on a scale such as from 1 to 5.
- If needed, it is good to have a reference to an output as discussed earlier.

Once the forms are ready and the vendor has made their preparations, it is time to schedule and conduct the workshops. The schedule for the workshop should be discussed and formed together with the vendor. The vendor has performed many similar meetings and their input is highly valuable. At the same time, the analyst must ensure that the workshop serves the company and not the vendor. The analyst must also think who to invite to the workshop. Normally, a core group of users participate for most of the workshop. However, if the solution has certain parts that are relevant to users from other departments, they should also attend specific sessions.

At the end of each day, the users should have their own discussions without the vendors. It is important that these discussions take place quickly while the information and impressions are still fresh in the mind. The discussions should revolve around the evaluation where the users share their views, impressions, and thoughts. It is also important to ensure that the users are able to see everything they wanted. If a certain functionality was not properly covered, or if there are open questions, they

Table 17.1 Example of an evaluation form

No.	Question	Comment	Rating
2.1.2	How do I find unpaid invoices?	Can only search on customer id	3
2.1.3	How do I change the status of an invoice?		4
2.1.4	What statuses can I choose from?	Definable	2

should be noted and covered the next day. Most commonly, the standard solution will fulfil most of the requirements. When support for a certain functionality is lacking, there are usually discussions about how the problem can be solved. This would either require development or change in the process, so a suitable alternative can be identified. It seldom happens that a "show-stopper" functionality lacks support. Such serious gaps should have been identified earlier.

After the workshops are completed, the forms are gathered, and the results summarized and analyzed. A final report is prepared, and a decision is taken on which solution is better. It should be noted that this part of the evaluation considers the functionality of the system and not the assessment of the vendor.

17.1.5 Vendor Assessment

When assessing the vendor, the cheapest solution is not always the best. Consider a company evaluating two solutions. System A is cheaper, but it does not offer full functionality. The other (system B) is more expensive but offers better coverage. Although system B is the better one, system A was chosen due to the lower price, thinking that with adding lacking functionality, it will still be cheaper. During the implementation project, the functionality is developed. Two aspects emerge that prove difficult to manage. The first is that system A cannot be integrated with the other systems to manage the functionality and as it is an off-the-shelf system, it is like a "black box." This means that the functionality needs to be developed "outside" of system A. The other aspect is that the contract dictated a cheaper price but all development requiring resources from the vendor, will be billed hourly. These two aspects made the solution more expensive than system B. Sometime later, the vendor lost a few important clients and experienced financial pressures. They chose to reduce their development team which led to their product falling behind their competitors. In the end, although system A had a cheaper price tag, it ended up costing the company more.

The above example illustrates that price is not the only parameter to consider. Other perspectives to consider when assessing the vendor are as follows:

- Financial Stability: The financial stability of a vendor is important as it related to their capacity to invest in their product and customer service. Furthermore, the more stable they are, the less likelihood there is of going bankrupt.
- Availability: The availability of a vendor is an important factor for customer support, further development, consultation, for upgrades and so on. If the vendor offices are located in a different time zone, availability will be restricted. Furthermore, the culture (corporate and country) of the vendor can influence the relationships. Another aspect of availability is how important a customer is the company to the vendor. If the vendor has three large customers and a company buys a very small solution from them, it is likely that the larger clients will be prioritized.

- Expertise: The level of expertise of the vendor, their staff, their coders and so on should be considered. A vendor that attracts and develops its resources, the skills, and competences of its staff, is more likely to follow the trends, develop quality solutions, and keep their products competitive. Another aspect is the vendor's expertise in the industry.
- Reference Clients: It is important to have conversations with the vendor's existing customers, to learn more about how their relationships are, what are the strengths and weaknesses of the product, their experiences of implementation and upgrades and similar aspects of a software solution.
- Vendor Market Position: Another aspect to consider is the position of the vendor in the market and how they compare with their competitors. It is important to know if the vendor is a leading market player or has been marginalized. Is the vendor an up and coming player or an established business? Furthermore, the reputation and track record of the vendor matters as well.

In short, the evaluation of the vendor is complementary and a very important part of the overall assessment of alternative standard solutions. Once both evaluations have been made and the results analyzed, a basis for selecting the best forward options can be established.

Once a vendor solution has been accepted, there are several options on how to move forward. One way is to sign a contract and begin the implementation. This can be risky; however, a better option is to do proof of concept. This means to implement the system in a smaller context for the purpose of gaining more information about the suitability of the system.

17.2 SaaS – Software as a Service

Most large companies use legacy IT systems. These systems had a structure where the databases were on the premise of the company or in-house. This also meant that the IT systems were only accessible to the company. Companies needed IT systems for specific purposes such as IT support for managing payroll processes. To this end, they developed their own systems to support payroll, HR, invoicing and billing, CRM, and the management of various resources. The development and maintenance of such systems were costly but not critical nor important to the core business of the companies.

This situation opened up a space for a new kind of business. Companies developed specific IT systems for processes such as HR or billing. These companies became vendors that offered commercial off-the-shelf systems to other companies. As such, the vendors offered standardized IT systems that companies could buy, install, and implement to manage their own processes. Companies buying such IT systems, would customize them. The benefits were clear as companies would no longer need to build their own systems, neither did they need to invest time and resources in enhancing them. Vendors would release upgrades and companies

would only need a few resources to manage the system in-house. Although such off-the-shelf products posed certain challenges, the benefits could not be ignored.

With the digitalization and emergence of the internet and "cloud", it became possible to host such solutions at locations outside of the companies using them. Rather than installing a full off-the-shelf system locally, the system could be accessed via the internet. This enabled a new business model, namely offering software as a service (SaaS) [167, 168]. SaaS is an IT system that is centrally hosted and delivered as an application over the internet. In essence, rather than buying an IT system and installing it in-house, the software is subscribed to (usually a license model) and accessed via the internet (Fig. 17.2).

It should be noted that SaaS is not the only form of "as a service." It is possible to use IaaS (infrastructure as a service) where the company manages the application, data, middleware, and operating system. However, the vendor manages the servers, storage, and the network. Furthermore, there is PaaS (platform as a service) where the company manages the application and the data, but the rest is managed by a vendor. As can be seen, there are different variations of the "as a service" concept.

The benefits of SaaS are significant and therefore, such solutions have become increasingly popular. Vendor assessment is no longer a matter of comparing different IT systems that can be installed in-house. However, one should be cautious and, considering the context, be aware of the main advantages and disadvantages of SaaS versus in-house solutions. The main advantages of SaaS are:

- Faster implementation/deployment of the solution
- Reduced infrastructural and maintenance costs
- Greater flexibility
- Better customer service

An in-house solution (own built or bought from a vendor), requires implementation. The implementation of deployment of the solution is usually not a trivial matter. The preparations such as set-up, configuration, testing, integration and so

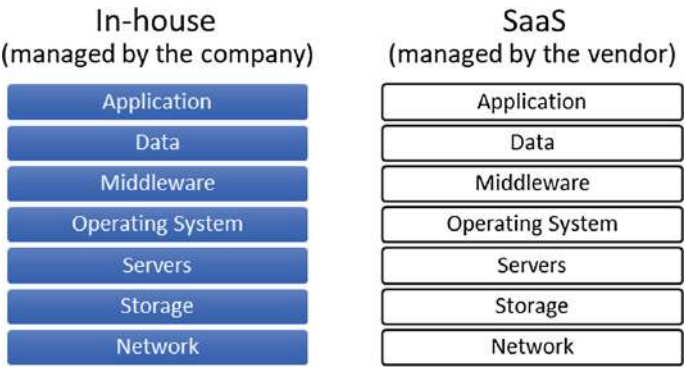

Fig. 17.2 In-house and SaaS solutions comparison

on, can take months to prepare. SaaS does not have the same deployment. In essence, a SaaS solution requires setting up user accounts and data. Once that has been done, it is ready to be used.

A company hosting an in-house solution will need to invest in the IT infrastructure such as storage space, database management, personnel, and other resources. As these infrastructural investments are not needed with a SaaS solution, it is cheaper. Likewise, the vendor hosts their SaaS software centrally but it is used by many of their customers, and vendors enjoy the benefits of economies of scale. The benefit is also in reduced maintenance costs. When running systems in-house, one has to consider the maintenance of the system, the internal support, developing enhancements to keep the system up to date or in compliance to regulatory changes. SaaS vendors cover all of these aspects. This includes costs such as bug fixes and upgrades.

SaaS solutions also offer greater flexibility. If a company wishes to change systems, it is quite easy to do so as compared to replacing an in-house solution. Replacement requires ending a subscription and ensuring that the data is transferred. However, with an in-house system, decommissioning the system requires some effort.

The customer service provided with SaaS solutions is generally of a higher quality in terms of know-how, availability, and documentation. For an in-house system, the support is restricted to those working with the system. These resources will know this particular system and are normally available during working hours. Cost issues deter companies staffing systems that are not supporting core processes. As such, many of such support systems end up having very few resources allocated to their maintenance and development. This naturally limits the availability of the resources. On the other hand, SaaS companies serve many companies and will have 24 hour support. Furthermore, they are very knowledgeable about their product and the business processes. In addition, as they have many customers and therefore, know about different problems, issues, challenges, they are in a better position to help resolve issues.

While there are clear benefits of SaaS, it might not be the best solution for any given context. The choice between in-house and SaaS is not straightforward but rather dependent on several parameters. Some of the main aspects worth considering as the main benefits of SaaS, in addition to the points listed above, are as follows:

- As SaaS comes as a standard package there is little room for client specific customizations. If a client wishes a functionality that is original and within the strategy of the SaaS company, it might be delivered but not within the company's specific customization. In-house solutions, on the other hand, allow for adaptation and customization. The company is free to include any functionality as it wishes. The system can be adapted to fit the needs perfectly. Vendors offering solutions that are installed locally are interesting in this case. They need to be configured as they are built to be very general but customizable. As such, such solutions can be customized. However, one should think twice before

doing so. First of all, the vendor offers upgrades on the standard package. Any customized part will most likely need attention with every upgrade (particularly the main upgrades). Secondly, if a company has a functionality that gives it a competitive advantage over its competitors, the vendor might include that function in its standard package. As such, all competitors using that solution will receive it.

- In the case of SaaS, one important aspect to consider is how well the functionality offered by the SaaS fits the need of the company. If most of the needs are fulfilled and those left unfulfilled are secondary, then a SaaS might be a viable alternative. However, if some of the important needs are not met, SaaS might not be the best option. A form of gap analysis can show the fitness to needs. In such a gap analysis, the needs are contrasted with the functionality offered by the SaaS.
- SaaS license costs are based on the number of users or the size of the company. As such, the more users, the more the company has to pay. In-house solutions, on the other hand, do not cost per user but rather, the more users the system has, the less the marginal cost. As the number of users grow, the cost per user decreases. It should be noted that some SaaS solutions have subscriptions for enterprises that allow an unlimited number of users. This makes it less straightforward, but the same trade-off applies. As such, it is another factor to consider.
- Service Level Agreements is a form of contract between the customer and the deliverer of IT solutions. Such agreements dictate what is expected from the service provider in regard to quality, responsibilities, support and so on. Such agreements are also set up within a company, for instance, between the IT department and the internal client departments. If the solution is in-house and own built, the company has full control over the terms and conditions of the SLAs. In the case of a vendor provided solution installed in-house, the SLAs are usually negotiated and there is room for customized SLAs between the vendor and the company. If a system is very critical for a company, it is possible to set up agreements securing prioritized attention and resource allocating within the vendor for example bug fixes. For SaaS, the SLA is a standard agreement issued to all of its clients. As such, the companies have to accept the standard SLA.
- Depending on the business, data confidentiality, security, and how the data is used can be a very important part of the decision. Naturally, if the solution is installed in-house, the company has full control over how it manages the data. However, if the solution is hosted at another location as is the case with SaaS, the company does not have full control. In such cases, the matter must be examined closely. It does not necessarily exclude the possibility of SaaS, but it must be a decision taken with care.
- If the company wishes to extend the use of the system to new geographical locations, it is better to go with SaaS. As discussed previously, a SaaS solution does not require any deployment. If a company has all of its processes running on a SaaS solution, it can set up a business in a different country within days. However, this is not the case with an in-house solution. Naturally it depends on

what kind of system and the architecture but usually SaaS will be faster and cheaper.

- If extension and development of new product features are important to the company, it is better to consider in-house solutions. With in-house solutions, the company has full control of which product features to develop, when to develop them, and how they should perform. SaaS, on the other hand, will follow their own plans. Although these plans are highly influenced by what the customers ask for, the decision is with the SaaS provider.

We have discussed several parameters worth considering when choosing between own built, vendor solution installed locally, or SaaS solution. As we have seen, the best solution is dependent on the context. These parameters should be carefully examined, and the pros and cons of each solution evaluated.

Chapter 18
Deliver Solution

All the work done so far is about understanding the current state, finding possible solutions and finally selecting the best suited solution, and designing it. The next step is to develop the solution. The most common way is to set up a project responsible for developing and delivering the solution. Information systems are involved when an IT project is initiated. The process by which a software intensive solution is developed and implemented is called the "software development process". Regardless of the different philosophies and methods for developing software, the same set of main steps exists in all of them. Such projects normally define the requirements and specifications, develop (code) the solution, test the functionality and implement the solution. For such projects, a project manager or similar coordinating role is appointed who has the overall responsibility of delivering the solution. The role of a business analyst changes during the delivery phase of the process. In this chapter, we briefly cover the main approaches to software development and discuss the role of the business analyst.

18.1 Predictive Versus Adaptive Approach

Software development methods have evolved and there are an impressive number of different methods available. As mentioned before, all methods carry out the same or very similar sets of activities such as specification, coding, and testing. However, different methods approach the execution of these activities differently. The traditional approaches rely on a sequential and procedural process for development of a solution. These are called "predictive" approaches in BABOK. Examples of such methods are the waterfall method or the V-model. Also, there are methods that decompose a solution into smaller parts and deliver the solution iteratively and in smaller parts. These methods are categorized as "adaptive" approaches in BABOK, commonly known as agile methods.

F. Milani, *Digital Business Analysis*,
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18.1.1 Predictive Approach

Predictive approaches seek to define the projects as much as possible prior to working on development and implementation. One of the oldest methods to develop systems and manage projects is the "waterfall" method [63, 176]. The method is no longer applied in its strictest form as when it was created. However, methods based on the waterfall methodology are still used today. The original waterfall method follows a sequential process where each step of the whole project is taken once the previous step has been completed (see Fig. 18.1). The development of the system will not start until all the detailed requirements have been elicited and approved. The steps do not overlap and are not flexible as once a step is completed, it is not possible to go back. As such, the whole project plan has to start at the beginning and continue until the end.

The classical waterfall method is not applied today due to its rigidity. To address this, different versions have been introduced. Such versions include an "iterative" development and the "V-model". The iterative development method divides the project into smaller chunks and manages each chunk according to the waterfall method. The V-model follows the same principles as the waterfall method but allows for deviation from the strict sequential order of steps. The testing procedures are developed before the coding is done whereas, in the waterfall method, testing is not considered before the code development is concluded.

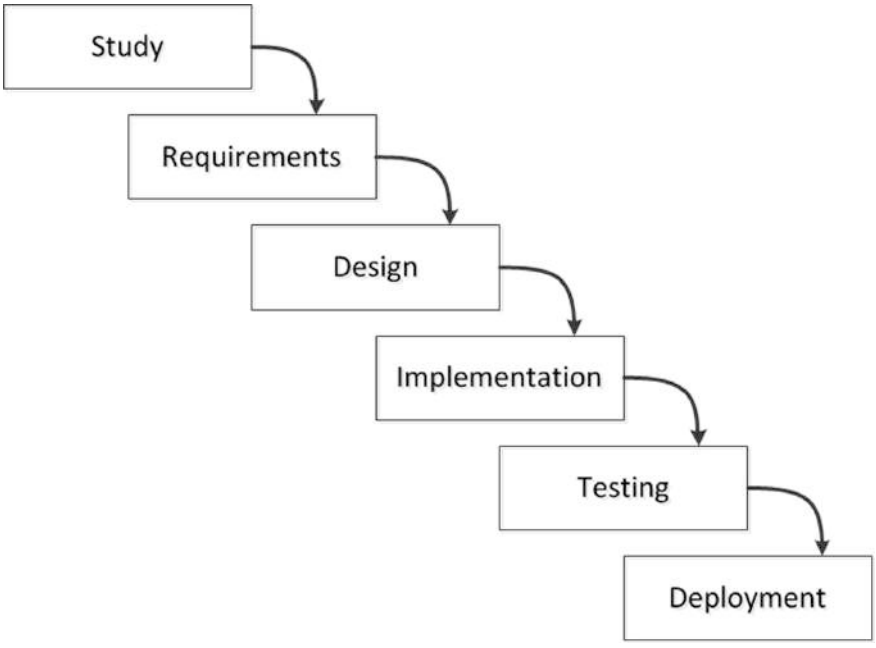

Fig. 18.1 The classic waterfall method steps

18.1.2 Spiral Model

Spiral Model is a widely-known method for software development that has elements of both the waterfall and agile methods [177]. The spiral model has four phases, planning, risk analysis, engineering, and evaluation. A software project moves repeatedly through these four phases in spirals. In the first spiral the basic requirements are set, risks analyzed, code developed and finally the results evaluated. If the results are satisfactory, the next spiral builds upon the first spiral. If the results are not as expected, the problems are addressed. As such the progression of the product is done in steps (spirals) where the outputs are evaluated by the customer and verified before the continuing to the next spiral.

The spiral model has the advantage of taking risk analysis very seriously. Furthermore, it has documentation and predefined steps but at the same time software is produced early on for the customer to evaluate. The spiral model can be used for large projects, but it can be very costly to use.

18.1.3 Agile Approach

The waterfall method was created in an era where stability and predictability were common in the business world. However, with the rapid changes to many aspects of the corporate environment, waterfall-based methods proved too complicated and risky. The strong emphasis on processes and tools, the need for massive documentation of requirements and other results, the contractual relationship between phases, and the need to follow a pre-defined plan with little room for changes, caused many headaches and at times became very difficult and problematic. In the wake of software development projects that exceeded budgets, failed to reach their quality goals, caused software developers to work in stressful working conditions, a group of developers sought to find a better way. They drafted a manifest that is now known as the Agile Manifesto. The agile manifesto reads as follows:

> *"We are uncovering better ways of developing software by doing it and helping others do it.*
>
> *Through this work we have come to value:*
>
> ***Individuals and interactions*** *over processes and tools*
>
> ***Working software*** *over comprehensive documentation*
>
> ***Customer collaboration*** *over contract negotiation*
>
> ***Responding to change*** *over following a plan*
>
> *That is, while there is value in the items on the right, we value the items on the left more.* [135]*"*

As can be understood from the manifesto, it aims at improving the software development process by putting "individuals and interactions over processes and

tools, working software over comprehensive documentation, customer collaboration over contract negotiation, and responding to changes over following a plan". The manifesto also states that while there is value in processes, tools, documentation, negotiation, and following a plan, there is more value in considering interactions, working software, customer involvement, and responding to change. At the dawn of agile methodology, there was much to be learned but as these methods have matured, an increased number of organizations have implemented agile methods, even for larger projects.

Adaptive or agile methods focus on delivering solutions (value) in iterations (see Fig. 18.2). Customers can see parts of the solution in iterations and give their feedback, request changes, and give approval. The core idea is to break the full solution into sections that are incrementally delivered, examined and approved by the customers. Such an approach allows for the software development to be more agile and adaptive to changes. This enables the customers to see the solution earlier and more frequently as it matures into a full solution. This results in customers having a strong ownership of both the development or evolvement of the final solution and the priority of what parts are more important. With such methods, a basic product can quickly be produced and implemented, and further enhancements and improvements follow later.

Some commonly known and applied agile frameworks are Scrum, Extreme Programming, Kanban, Behavioral Driven Development (BDD), and Test-Driven Development (TDD). Although they are different, they all have a common core set of activities. All methods have the concept of prioritizing and working with smaller and manageable parts, incorporate the concept of closer collaboration in the delivery teams, development of code, testing, and deployment. The differences are more concerned as to how these main activities are conducted. TDD proposes to start with the test cases and then to write the code. BDD on the other hand, begins with how the solution should behave. Scrum follows the same pattern as described above but has clear roles such as "scrum master". Furthermore, Scrum also

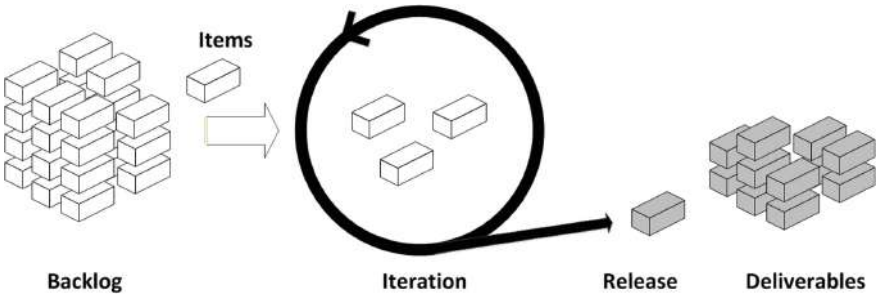

Fig. 18.2 Example of a generic agile approach

incorporates daily "scrum meetings" and has evaluations at the end of each spring (retrospective). It has been said that agile methods follow the same main process as predictive approaches but with smaller parts. Although it is not that simplistic, it is an interesting point.

However, there are also disadvantages. When the customer is involved, there might be delays due to the customer not being able to provide the feedback and approvals in time. In agile methods, the team will work best if they are fully dedicated to the project and situated physically in the same location. If these conditions are difficult to fulfill, it can affect the time and quality of the project. Finally, as parts of the solution are delivered, it is very difficult to build a solution that is architecturally stable when it concerns large-scale projects or solutions requiring higher levels of integration with other information systems. As agile methods are improving, such challenges are being managed. It is worth noting that most companies do not fully implement an agile method or in its purest form. Rather, the methods are adapted to the context of the company, often by skipping or introducing additional steps.

18.1.4 Selecting an Approach

If there are no organizational policies to use a specific method, or if both predictive and agile are acceptable, the following aspects can be considered when selecting a suitable approach. While Table 18.1 helps in selecting a method, one should bear in mind that agile methods are maturing fast and can increasingly be applied to larger projects.

Table 18.1 Selecting an approach [3]

Predictive approach	Factor	Agile (adaptive) approach
A larger and more complex project	Project size and complexity	A smaller and less complex project
Customers have difficulties being extensively involved during the project duration	Customer availability	Customers are willing and available to frequently be involved during project duration
Unknown or several complex integrations required	Integration level	None or few simple integrations required
Budget/time schedule is fixed and difficult to change/adapt	Flexibility and tolerance for changes	There is flexibility (budget/time)
Solution requires full feature set to be delivered	Time to market	Solution can be initially launched with limited feature

18.2 The Role of a Business Analyst in the Delivery of a Solution

The role of a business analyst will differ depending on whether the project follows a traditional (predictive) or an agile (adaptive) approach. Predictive methods of delivery prescribe analysis being done prior to the initiation of the development whereas agile methods incorporate the analysis with the development. However, agile methods also require analysis to be conducted prior to development. There is little difference between these preparatory procedures. As such, business analysis is conducted in a similar manner for both types of deliveries, but the extent will vary. However, when the project starts, the differences are more visible.

18.2.1 Predictive Approach

The role of the analyst changes during the delivery of the solution. As mentioned before, at this stage, a project organization is created to coordinate the development and delivery of the solution. Typically, a project manager takes over. However, it is important to note that the project manager works with managing the project. The project manager will apply knowledge, skills, tools and techniques to ensure activities are taking place that will deliver a solution that meets the requirements. As such the project manager is concerned with achieving the project goals. Therefore, the project manager defines the project, breaks it down into a manageable set of tasks, obtains the resources needed, and manages the team that performs the work, monitors the progress, manages the risks and keeps the project on track.

Ideally, the analyst has done all the work to define the current and the future state, has assessed and evaluated the alternative solutions and designed the selected solution. Therefore, the analyst does not have an important role in the delivery. However, the requirements will be examined closer and captured in more detail. It is only natural that issues will surface. It will be necessary to determine if the requirements need to be changed, modified or even excluded. The analyst knows the needs, the requirements, and the impact they have. As such, analysts have an overview that is very valuable when considering changes to the requirements. It is worth remembering that analysts focus on the outcome (value delivered) while project managers are primarily concerned with project outputs being delivered in time and within budget. The business analyst has an important role to secure that all changes are aligned with the raison d'être of the project. Such changes might also require input from key stakeholders with whom the analyst is in contact. In this context, business analysts are often directly involved in the change management process.

The analyst might also get involved in the acceptance testing. Considering that the analyst knows the requirements well, perhaps best, it makes sense to have the analyst involved. The business analyst's main responsibility is to make the whole

solution work and therefore does not end when project starts. The project will deliver according to its deliverable. However, that might not be enough. The receiving organization might need to prepare for the new solution. Such preparations can often be outside of the project scope. The analyst can work with the managers to secure that the receiving units are prepared. The intended value with the change initiative might go unfulfilled if the solution cannot be effectively incorporated in the operations. Every project is different. Some projects might include preparations for receiving solutions as part of their scope while others cover it partially or not at all. Changes and preparations in the receiving unit can be left to the managers. The analyst has been deeply involved in defining the current and the future state, few have as wide and comprehensive a view of what is required for the solution to be effective. Therefore, the analyst can play an important role in securing that all aspects are in place.

18.2.2 Business Analyst in Agile Methods

So far, we have discussed the analysis process as if it was a procedural process. Although we have frequently noted that the analysis work often deviates from such a straight process, we have used it to facilitate learning about the foundation of business analysis. It should also be noted that business analysis was born and grew in an environment of predictive approaches. With agile methods increasingly gaining a hold, and the foundation of agile methods being different from predictive approaches, the question of where the analyst fits into an agile method, should be asked. One should bear in mind that for agile projects, there is still a need to begin with business analysis. Agile projects do not start with just an idea. Some form of analysis needs to be conducted before a decision is taken to start a project. In this regard, there are similarities between the role of the analyst in predictive and adaptive approach es. However, in agile methods, the analysis continues in the project (delivery phase). Therefore, the depth of the business analysis in agile is not the same as for predicative methods.

It is also worth remembering that business analyst is a title and it is the actual business analysis work which is important. While many organizations have dedicated teams of business analysts and this role as a job title, what defines business analysts, is the work. Business analysis covers wide areas of the profession and not all business analysts perform all business analysis work.

Agile methods do not have a business analysis role or title. Agile methods such as Extreme Programming [178], Scrum [179], and Lean Development [180] do not have any dedicated or well-defined role mapping to business analysis. Scrum has a "scrum master", "scrum product owner", and a "scrum team". The scrum team does all the work associated with what is delivered to the customer. The scrum master facilitates the work and shields the team by removing impediments, and the scrum product owner represents the end customer. These are the roles and as can be seen,

there is no role of business analyst. However, the work that is conducted intersects and overlaps with that of a business analyst.

The main difference is in the time and order perspective. Agile methods focus on collaboration and ongoing engagement whereas traditional methods have phases, stages, or hand-offs. Therefore, in traditional methods, the business analysts have a dedicated phase where they work intensively with requirement specification. However, in agile teams, the business analysis can take place on smaller chunks, at shorter intervals, with no clear demarcations between the different tasks, and in close collaborations with the other roles. In short, the same work is being conducted but with a different rhythm in a less structured way for smaller parts. In this connection, a clarification is in order. Delivery concern projects. Agile is also applied for ongoing development of a software product. In such cases, the backlog never finishes as products always evolve and are developed. In such teams, there might be a business analyst or more commonly a software product manager.

The IIBA has published an "Agile Extension" [15] to BABOK for the purpose of tapping into the latest ideas and techniques of agile in the light of its relevance to business analysts. In this extension, we learn that agile business analysis is following the pattern of "iterative" and "adaptive" modes of work. Iterative refers to the work being done in shorter cycles. Adaptive, on the other hand, incorporates the idea of continuous change and refining the work in order to deliver the highest value. The foundation of iterative and adaptive is applied, according to the agile extension, in three horizons; strategy, initiative, and delivery. The strategy horizon is the highest level and focuses on "what" projects should be done depending on a variety of parameters. At this level, the concern is that of a project portfolio which we have discussed earlier. Once a project has been promoted for further investigation, it will be elaborated and prepared by a business analyst. At this level, the initiative horizon, the work is focused on a specific product or solution. The level of detail will naturally be greater than that of the strategy horizon but not as detailed as the next. At the next level, the delivery horizon, the actual work of implementing the solutions within a project organization takes place. At this level, common agile methods such as Scrum are used. We have already discussed the strategy horizon (project portfolio management) and previous chapters covered the main bulk of work during the initiative horizon (planning, current and future state analysis etc.). Here we focus on the delivery horizon and the value a business analyst can contribute. It should be noted that there is an overlap between the initiative and delivery horizon.

18.3 The Agile Mindset

The Agile Extension has translated these fundamental ideas into seven principles to guide agile business analysis. These are as follows:

- **See the whole** – The business analyst is constantly conscious about the end value that is to be delivered and as such, has the larger picture in mind. This means that the solution is always considered within the business context and the business needs. This ensures that the solution delivers actual value and not just a deliverable or an output. In short, the analyst concentrates on the "outcome," and not only on the "output".
- **Think as a customer** – The business analyst is aware and incorporates the viewpoint of the customer. The customer might be an external one or an internal (end-used). Regardless, the analyst can express customer feelings within the analysis work by considering the user requirements from a high-level to increasingly lower level of detail. By having this viewpoint combined with feedback, the solution will evolve as business and customer needs evolve to ensure delivery of solutions that has value for the customer.
- **Analyze to determine what is valuable** – Any given solution can include a set of functionalities and components of differing degrees of value. The analyst should be constantly aware of what functionality, parts, and components are most valuable. This requires an iterative journey between the needs and the solution to ensure that work (functions and components) is done in such an order to maximize the value.
- **Get real by using examples** – The analyst should work with examples that are realistic. By having examples, the analysis will be more complete as all aspects such as user roles, actions, data, and rules that are encountered, analyzed, and developed. Using examples allows for a better understanding of the solution and better testing. Furthermore, using examples makes "fuzzy" needs seem down to earth and allows for a better common understanding among stakeholders.
- **Understand what is doable** – Most of the projects will have constraints such as capabilities of the technology, the skills for, time frame, the speed of the development, or budgetary restrictions. Such constraints can limit the value delivered. However, by understanding what is doable, the analyst continually analyzes the needs and how they can be satisfied given the constraints. In short, it is about finding the way forward in a balanced way within the boundaries of the constraints to ensure delivery of value.
- **Stimulate collaboration and continuous improvement** – The analyst has an important role to stimulate the collaboration between those who have a need and those who develop a solution. Both have to feel that they make meaningful and important contribution to the process. Furthermore, this process should be characterized by continuous improvement and learning. All involved parties should seek opportunities for improvement.
- **Avoid waste** - The analyst will find that the list of activities and analysis that can be performed is very long. However, not all work is equally value-delivering. At the core, we have the work that directly adds value to the solution. We also have work that adds value but not directly to the solution (indirect value). Finally, there is work that adds no value at all. The idea is to eliminate all work that does not add any value and reduce work that has indirect value. In this way, the analyst avoids waste by for instance,

- refraining from producing results before they are needed or producing just enough when needed (such as documentation).
- to the utmost extent use the same type of models when eliciting, analyzing, specifying, and validating requirements.
- keep models and other artifacts as simple as possible while meeting their intended purpose.
- communicate with clarity and efficiency.
- maintain quality and consistency in the work so as to avoid re-working or additional work

These principles are meant to be general for agile business analysis. However, their practical expression will differ depending on the horizon level. Considering the whole or avoiding waste will be expressed differently when working on the initiative horizon as compared to the delivery horizon. While these principles should permeate the work of an agile business analyst, there are some methods and techniques that are used more frequently within agile as compared to traditional methods. Some of them are discussed below. These are impact mapping, concept of a minimum viable product (MVP), backlog management, and reviews. It should be noted that these techniques and methods can be used in other steps of the analysis process and with other software development methods. In no way are they restricted to the delivery phase or agile methods.

18.4 Impact Mapping

Agile methods require a stronger link between the "why" and the "what" in projects. It is therefore important to have the features and different deliverables connected to the goals of the project. One way to achieve this is to visually illustrate such connections. For this purpose, "impact mapping" [15, 181] can be used. An impact map expresses these relationships visually much like the benefit tree or issue tree discussed previously. As such, impact maps show the "larger picture", linking what is being delivered with the overall purpose (why) of the project. An impact map has four main components. The first is the "goal" which identifies the goal of the solution or in other words, answers the question of "why are we doing this". One might think that the goal should be clear. However, not all the team members have a deep understanding of the goals. One of the reasons might be that team members can change or that business value or objectives are not always clearly defined and described. Furthermore, in agile settings, the goal might slightly change as new information emerges. In defining the goals, the focus should be on the "why" rather than defining scope or stating that a certain product is to be built. Goals should follow the guidelines of SMART as discussed earlier. It might be difficult to define the goal as one single sentence or number. In such cases, it is better to consider the business value and complement such statements with indicators such as KPI if possible. An example of a goal might be "open a new market by September next

year" or "increase customer satisfaction by 50% by the end of this year". The goals discussed should not be new but rather rely heavily on the analysis work and the results gained during the current and future state analysis. Furthermore, the goals here are directly connected to the evaluation criteria set for the project.

Next come the "actors" i.e., the stakeholders who can make contributions to achieving the goals. The actors are those who can produce the desired results. Actors are very similar to stakeholders as discussed previously. The third component is the "impact" denoting the actions needed to be taken in order to achieve the goals. The impact takes the actors' perspective in relation to the goal. As such, the impact answers questions beginning with "how", such as "how can the actors achieve the goals?" Finally, the impact map has "deliverables" that list the functions required for the actors to achieve the goals. The deliverables follow that once the goal, actors, and impact are clarified, the "what" can be defined. In other words, "what can be done to support achieving the required impacts?" Deliverables define what activities will create an impact that helps the actors realize the goal.

An impact map is typically captured in a decision tree format as depicted in Fig. 18.3. On the left, the goal (why) is set followed by the actors (who), impact (how), and deliverables (what). The map might be bigger than expected but the aim is not to implement all the parts of the map. Prioritization techniques, as discussed previously, can be used to determine the best path forward. In essence, the shortest path to the goal should be of priority. That is the one that will deliver best value.

In Fig. 18.4, we see an example of a project aimed at reducing the transaction costs by 20%. The main actors are the traders, the back-end staff, and IT operations. As can be seen from the impact map, the traders are to be impacted to reduce errors and do more standard trades. At the back-end, they are to increase automation and prioritization, and finally, the IT staff is to run cheaper systems. At the far right, the deliverables that will enable such an impact are listed.

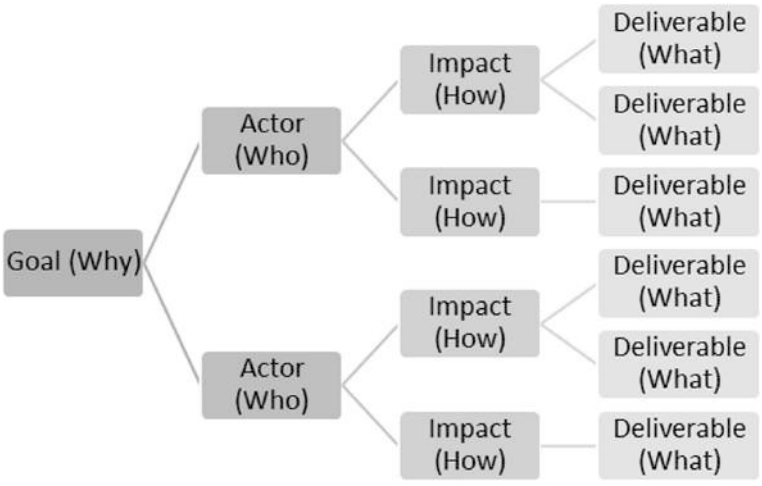

Fig. 18.3 Example of a generic impact map

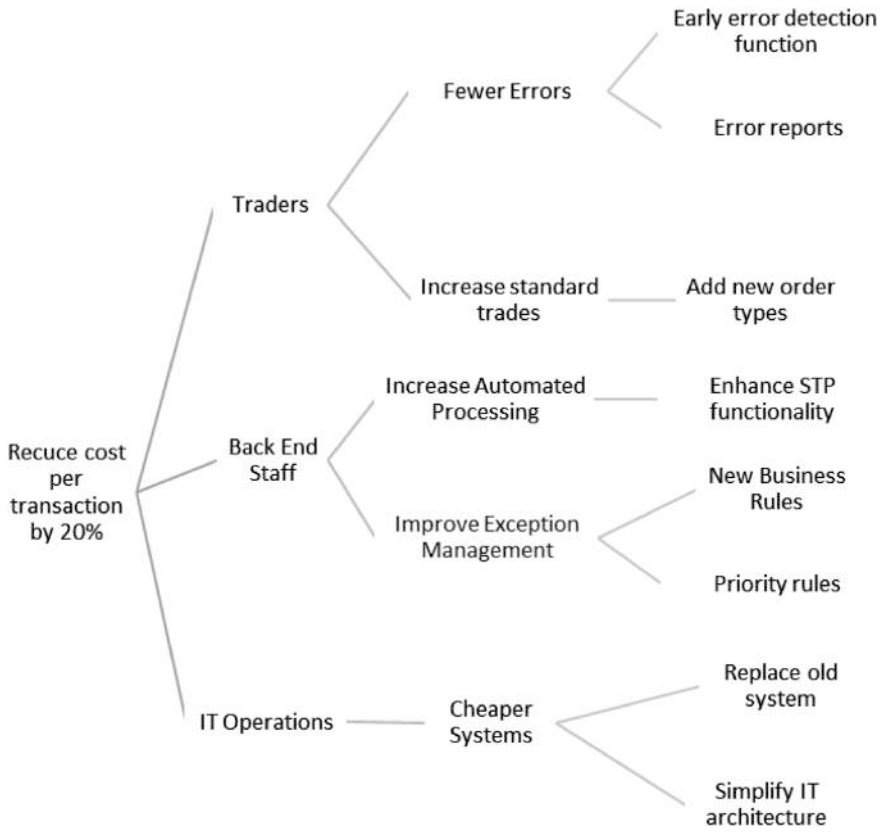

Fig. 18.4 Example of impact map for reducing transaction costs

A process map is typically generated in workshops where all key stakeholders are gathered. The discussions should start by beginning with the goal and move to the right in the impact map. As the work progresses and each component is identified, they are visualized in the format of the impact map. The business analyst can play an important role in both facilitating such workshops and in giving input to the discussions.

18.5 Minimum Viable Product

Agile methods value iterations with incremental deliverables and feedback. In a way, working software or product is better than finished products. This contrasts with the idea of traditional methods to develop a product in its fullness before

releasing it. To reduce the risk of developing a product that is not sought after or what the customers wanted, the concept of "minimum viable product" (MVP) [70] was introduced. The concept of MVP is to identify the minimal required set of features required for a product, so it can be deployed and delivered. It is the very first version of a product that works but only has the basic features. The process is to first determine the problem that is to be solved and identify a set of ideas of the solution. Next, the minimum required features are identified. These features help figure out if the solution will solve the problem. Once the MVP is created, it can be tested with real customers and the feedback received, will aid in determining the next features to be developed. As such, the product evolved iteratively based on real-life user experiences, input, and feedback.

The MVP is not the finished product but needs to be further developed. A product roadmap outlines how a product is planned to grow. It is a strategic map showing what features will be developed in the coming phases. A product roadmap [182] gives an overview of the future development plans of a product. The focus of such a document is the value. As such, the roadmap clearly defines and captures the vision of the product and how the vision will be achieved. A product roadmap also captures the requirements at a high-level. The product roadmap is a living document subjected to change.

18.6 Backlog Management

Agile methods work by taking one or few items at a time and developing, testing, and deploying them. While some items are being developed, there will be a number of remaining items. These items, such as features, are maintained, prioritized, re-prioritized, and examined to make the best decision as to which items to develop next. The items that have not been developed need to be managed. Managing these items is "backlog management" [183]. In essence, it is a portfolio of items relating to a specific product or project. A backlog is dynamic meaning that if items become redundant i.e., do not deliver value to the goal of the project, they are removed. If new items are discovered, they are added to the backlog. In managing a backlog, consideration is given to how items should be described, tracked, reviewed, prioritized, selection of items to develop, and keeping the log updated and relevant.

Backlog management incorporates four elements. While different methods and tool support exist, these four main elements are in some form present in most backlog management approaches. These are as follows:

- **Items**: An item is simply something that needs to be developed. Items can be user stories, use cases, functional or non-functional requirements, defects, bugs or any other piece of work.

- **Prioritization**: All items are not equally important or critical. As such, the items are prioritized in relation to the other items. Naturally, the priority of the items can change over time. The prioritization methods vary but in essence, the idea is to have an order by which items of more importance are distinguished from others. Items delivering the most business value have a higher priority.
- **Estimation**: Items differ in regard to their size i.e., how much effort is required to complete the item. The items are also captured in various degrees of detail. Some might be described in more detail while other items are broadly described. When items are included in the backlog, they might be lacking details. However, it is sufficient to have a rough idea of the amount of work required for the completion of the item. As an item becomes more important and prioritized, more details can be added in order to get a better estimation of work required. Regardless, the backlog also includes an estimation of the items. The estimation is required to better make decisions as to which items to select and how many at each iteration.
- **Change Management**: Items in the backlog have a priority. The priority is relative to the other items. As such, when there is a change, the priority changes as well. Furthermore, items are removed from the backlog once completed or if a decision is taken to discard them. Although once removed, they can be put back. Regardless, as the stakeholder needs could change, the project could require more time and funds than estimated, or if delivered parts are affected with bugs, changes to the backlog will be required. Managing these changes is also part of the backlog management.

The difference between backlog and product roadmap lies in the development of detail. The product roadmap outlined the strategic journey of a product whereas the backlog contains items required to develop the product. The roadmap focused on major releases, each with a goal. However, the backlog contains more details and features captured as user stories, use cases and other requirement specification methods. Similarly, the horizon of the roadmap is about one year ahead whereas the backlog contains items which are selected for the next iteration that are normally about one month. Finally, roadmaps are reviewed and updated quarterly, but the backlog is updated with each iteration.

Backlog refinement serves the purpose of ensuring that the items in the backlog have enough detail and clarity for development. As mentioned before, not all items are captured in detail. These items need to be prepared when planning workshops. Business analysts can play an important role in preparing the items in collaboration with the stakeholders. If the item is expressed with user stories, the analyst can ensure that they comply with the INVEST criteria. If the item is too large, the refinement could include decomposing the user story to meet the INVEST criteria. However, the analyst does not unthinkingly take an item and refine it; there are times when it might be necessary to re-assess if the item has high enough priority or whether it should be developed at all. If chosen, the refinement ends when it is captured in enough detail to allow the item to be developed.

18.7 Kano Analysis

Kano analysis can be employed as an aid to determine what features or attributes to prioritize when working with a product roadmap or backlog management. In a Kano analysis, the aim is to identify the features that customers view as absolute necessities, desirables, or exceed their expectations [184]. When we discussed value proposition and how it fits in the customer segments, we outlined that a good fit is when a product or service solves the job customers wants to have done, kills the pain and delivers gains. Kano analysis focuses on the "gain" aspect. For all products or services, customers expect or demand a set of basic features. These are features that need to exist. For instance, if buying a smart phone, the basic features are the ability to make a call, connect to the internet, download and run mobile apps and so on. Any customer buying a smart phone will expect these features. These are called "threshold attributes" in kano analysis. On top of these, there are attributes or features that customers view as "the more, the better". The more memory a smart phone has, the better. These attributes, called "performance attributes" are heavily linked to price. The more "performance attributes", the more the customer has to pay. There are also attributes that the customers do not expect or don't even know they want until they experience it. These are called "excitement attributes". Smart phones with a built-in wireless charger or heart rate monitor are examples of excitement attributes. In addition, there might be attributes that customers are indifferent towards.

A Kano analysis can be done in different ways but will involve customers. A simple approach is to ask two simple questions (functional and dysfunctional) for each attribute. The questions are as follows:

1. How would you feel if the product has the attribute A?
2. How would you feel if the product does not have the attribute A?

The responses given are commonly "like it", "expect it", don't care", "live with", and "dislike." Although there are other formulations such as "tolerate" instead of "live with", or "helpful" instead of "like", they all keep the same theme. The attributes can be classified given the grid in Table 18.2.

Table 18.2 Matrix of attribute classification

	Like it	Expect it	Don't care	Live with	Dislike
Like it	Q	E	E	E	P
Expect it	R	Q	I	I	T
Don't care	R	I	I	I	T
Live with	R	I	I	Q	T
Dislike	R	R	R	R	Q

Following the grid in Table 18.2, attributes are classified as questionable (Q), performance (P), threshold (T), indifferent (I), excitement (E) or reverse (R). Those attributes that must be present in the product, or in other words the threshold attributes, are mandatory. Performance attributes are those that as the quantity of the attribute increases, so does the customer satisfaction. Exciters are features that result in great satisfaction and allow you to put a higher price on a product. However, if they are absent, the customer is not dissatisfied. The questionable (Q) denotes that something is not quite right. For instance, if the customer responds that they like it when the attribute is present and when it is not present, it is not useful. The answers are contradictory. Reverse (R) refers to cases where the questions should be reversed i.e., by asking them in the opposite way. Finally, indifferent simply denotes when the customer is indifferent. It is common that customers' rate attributes positively but there is a trade-off. All attributes cannot be included. Therefore, it might be relevant to ask about how much more customers would be willing to pay to get such an attribute or similar attributes. Such questions can help determine what attributes to include.

The attributes identified and rated by the customers can then be plotted as a graph as illustrated in Fig. 18.5. A Kano model commonly includes two axes. The y-axis is customer satisfaction, and the x-axis is for degree of achievement (if they are perfectly implemented or not at all).

The model can be used to help identify features and attributes of the product. It might be used to find an edge among competitors, to determine what features to focus on, or as input in determining what features to develop next.

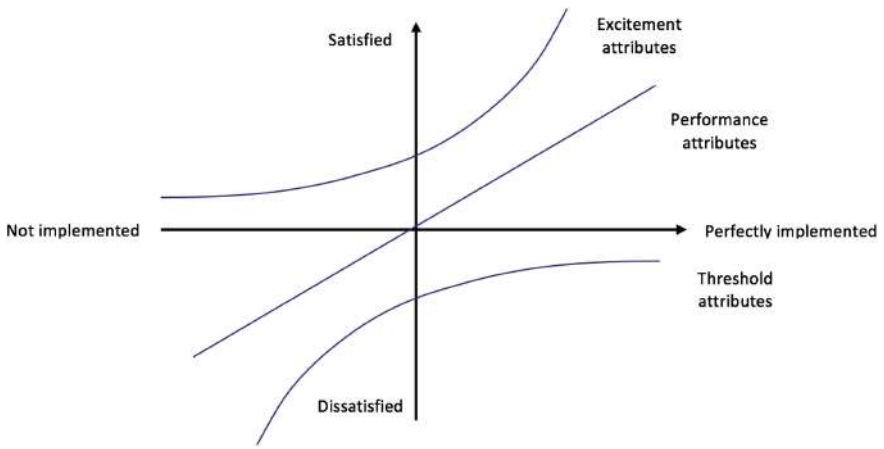

Fig. 18.5 Kano model

18.8 User Stories

Agile methods prefer requirement modeling techniques that are simple, to the point, and easily used by customers. In agile methods, it is better to have the customers or end users write the requirements. To address this, user stories are used. We have already discussed user stories previously. Agile methods do not want to produce unnecessary documentation and as such, requirements are detailed when needed, not before. As such, during the design and delivery phase, user stories are developed. However, these stories are decomposed into more detail when the time for development is at hand. During the agile delivery phase of a project, an analyst might encounter "story decomposition" and "story elaboration". Story decomposition is simply to break down a user story into smaller and more manageable pieces. As such, any user story that is either too big, not easily understood, difficult to estimate due to vagueness, is a candidate for story decomposition. Story elaboration is the next step i.e., detailing the design and acceptance criteria of a given story to the level of detail required for developing an actual working solution.

In essence, the idea is gradually to, when the time is right, detail the requirements (user stories). This means that there is no wasted time on detailing requirements that will not be used later.

As can be seen from Fig. 18.6, in the early stages of design and delivery, the focus is on impact and predominantly on why a requirement is needed. As these have been defined and agreed upon, it is time to capture the "deliverables" as user stories (requirements). These are then increasingly detailed in story decomposition and elaboration. Finally, they are realized by code, testing, and deployment. As such, with the progression of the iteration, the level of detail increases.

18.9 Continuous Learning

The concept of continuous learning is part of agile methodologies. Retrospectives [183] are used to reflect on what went well, what could be improved, and incorporate changes to improve the processes. All members of the team are invited to reflect on the latest iteration. As the past is used to improve the future, retrospectives have two parts. The first is used to reflect on the last completed iteration. The second focuses on what can be done moving forward with the next iteration. In such reflective meetings, it is important to concentrate the focus on the process.

While retrospectives focus on the internal processes of the team, reviews evaluate the content of a work product (one full, part, or package of deliverables). Reviews commonly include clearly communicating the objectives of the review (such as remove defects, secure conformance to set specifications or standards, and completeness). Once the objective is set and communicated, the review takes place. The review can be conducted by inspection where the work product is reviewed. It could also take place by doing formal or informal "walkthroughs". In a

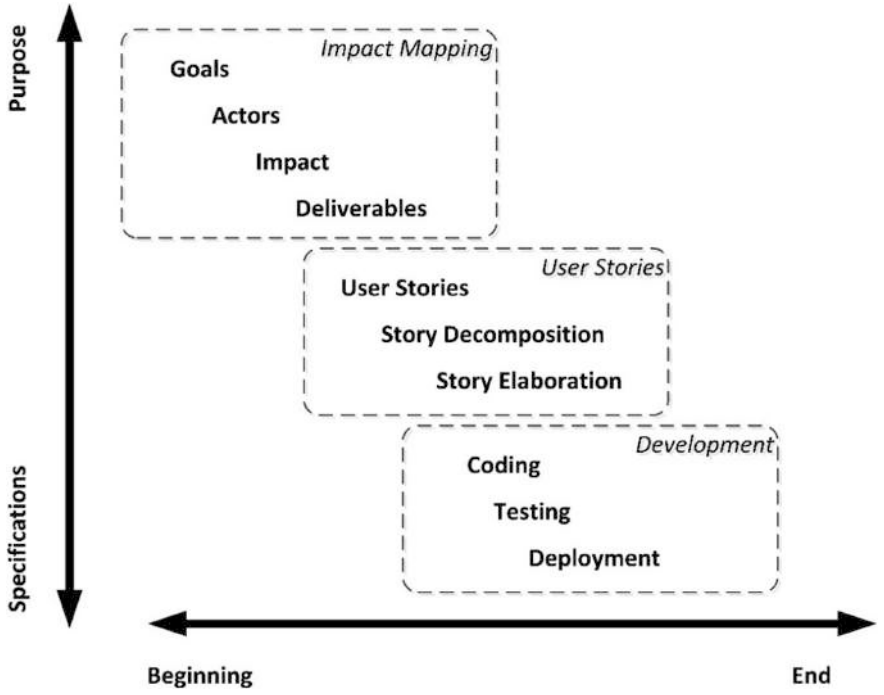

Fig. 18.6 User story details

walkthrough, the work package is examined step by step with stakeholders. Another form of review can be "pass around" where the work package is distributed to several stakeholders who offer their verbal or written feedback.

18.10 Data Driven Product Lifecycle Management

When doing business analysis within projects, design of a solution usually means that something will be completed by the end of the project. However, in some cases, a business analyst will work on continuously enhancing and improving a specific product. In such cases, work is conducted along an ongoing product lifecycle as depicted in Fig. 18.7. At a high level, the lifecycle is divided in three parts - beginning, middle and end of the life [185].

In the beginning phase of the lifecycle, the product is designed, produced, and marketed. This stage is followed by distribution, utilization and servicing. The final stage concerns recycling or disposing of the product [185, 186]. The lifecycle applies to both physical, digital, and hybrid (mix of physical and digital) products. Let us look at an example. A company develops a new website, which is carefully designed according to the brand image. This marks the beginning stage. Once the

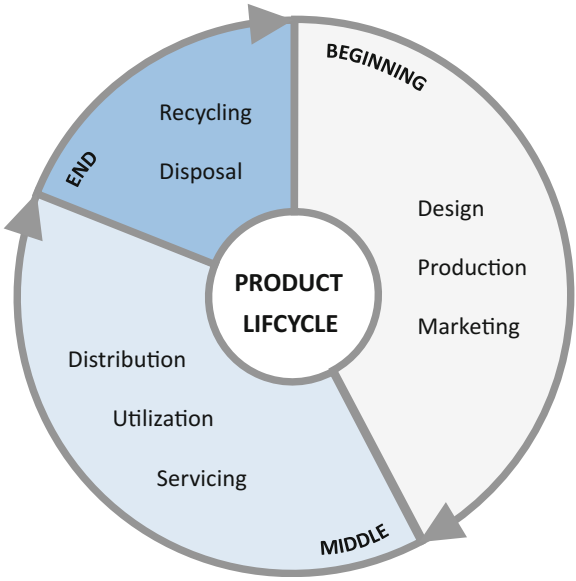

Fig. 18.7 Product lifecycle (based on [185, 186])

website is launched, the product enters its middle stage. This stage is characterized by continuous changes and improvements. The changes can be small ones such as improving the design and appearance, technical optimization, or larger such as introducing new content and features. During this stage, a business analyst might be involved in continuously improving the product. The work is not significantly different compared to that of a traditional change initiative. However, the change is often smaller in size and less complex. As such, each improvement initiative can be viewed as a small project requiring planning, current state, problem, and future state analysis, evaluation and assessment of alternative solutions, design, development, deployment and evaluation. In the final stage of the lifecycle, the product is either recycled or disposed of. If the product is recycled, parts of it are used in other products or put in a different context. In such cases, the lifecycle starts over again. Let us assume that the website becomes out of date due to changes in the brand image of the company, simply not good enough. The company can decide to completely dispose of the website and build a new one from scratch. They can also decide to do a makeover of the old website by keeping some parts and replace other parts with newer versions. In either case, it is the end of the old website. It is also possible to keep the website but change only some parts such as the checkout system. This means that the website is still alive but parts of it will be recycled or disposed of. In the digital era, products are enhanced and improved at a faster pace as compared to physical products.

The essential idea of product lifecycle management (PLM) is to manage a product from concept to disposal as efficiently as possible. Data analytics can be used in all the stages of the PLM to improve and optimize the product and its related processes. In the first stage, data analytics can be used to better understand

what the customers need by exploring customer data [185]. Production and manufacturing of the product can be improved by using data for predictive maintenance and energy-saving equipment and workspaces [185, 187]. Suppliers' data could be analyzed to find the most reliable and relevant partners [185]. In the middle stage of the lifecycle, data analytics can be used for smart warehouse management such as automated supply overview and stock orders [188]. Smart transport systems can also help optimize transportation like delivery by finding the least fuel consuming paths. If chatbots are used, data analytics can identify weaknesses and improve customer service. If there is enough performance and maintenance data, by means of for instance sensors, data analytics can help estimate which parts are still in a good condition and which parts require replacement or maintenance. The servicing team can predict when service is needed and contact the customer to schedule an appointment. This is in contrast to passively wait until the customer reports a breakdown in the product. By proactively managing such processes, machine downtime is reduced and costs associated with warranties are lowered [185]. Servicing teams, knowing what kind of issue it is, do not need to first visit the customer, diagnose, get back to bring or order the needed parts, and visit the customer again. Rather, pre-knowledge allows for bringing all necessary parts and tools to the first visit. This shows that data analytics enables understanding the customer journey better and thus allowing for opportunities to optimize processes in a customer centric manner.

In this context, data analytics requires successfully working with the data value chain in all steps of the product lifecycle. Relevant data has to be collected, managed, and analyzed. A challenge a business analyst might encounter is collecting and managing the data (first two steps of the data value chain). Data is scattered in different locations and once gathered, are in non-uniform format. For instance, delivery data and servicing data are two different types of data but in need of being connected to track down issues [187]. If delivering a product under "wrong" conditions might cause damages customers will report starting to use the product. To identify such causality, data is required from both delivery and servicing department. Gathering and making such data uniform in such a manner to enable meaningful analysis, is no trivial task and requires thinking along the lines of data value chain.

Each stage of the product lifecycle has different optimization and cost-reduction opportunities. Product lifecycles are not improved in one-time projects, but by incremental initiatives, each building upon the previous one. Each improvement initiative will require specifying KPIs to be improved. After the implementation of the change, the KPIs are measured to evaluate the success of the change [186]. For instance, if implementing a smart transport system, the cost of transportation should be the main metric. Having implemented the solution, the average cost of transportation is measured and compared to the goal. Although PLM focuses on optimizing the product, we note the touchpoints with business analysis. The main steps of product lifecycle encompass the business analysis process in miniature format but with data analytics as foundation for the analysis. Managing the data by collecting and synthesizing it, is essentially the same as eliciting information from

various stakeholders and putting it together in a meaningful manner. Analysis of the current state is present in PLM but with logs of data as foundational basis and methods such as customer journey mapping. The same applies to problem analysis. Having analyzed the issues and clarified the aims, different alternative solutions needs to be explored and assessed followed by design, deliver, and finally evaluation. In the end, be it a website or a back-office system, the underlying process is one with which business analysts are familiar.

18.11 Role of a Business Analyst

As can be seen from the above description, the business analyst can make a great contribution during the agile delivery of a solution. The analyst, having an agile mindset, can contribute with valuable input during the impact mapping, user stories, story decomposition and elaboration. Furthermore, in discussions regarding product roadmap and minimum viable product, the analyst has a unique perspective and therefore, much to offer. Considering that the analysts have a good command of the business needs and perhaps even conducted the initial study, they are in a unique position to see the larger picture. That makes the analysts' input regarding backlog management valuable. One should bear in mind that the customer is more involved during the delivery in agile methods but that does not necessarily mean that the customer is always right. We have discussed situations where the customer says one thing, but the actual need or root cause is something different. The analyst still has a role to play in bringing much needed facts and analysis to the table in agile delivery. In doing so, the analyst helps avoid decisions being taken on gut feelings. The analyst also has a responsibility to facilitate retrospectives and reviews. The role of the analyst as a facilitator and his or her skills to conduct workshops will surely prove to be very valuable during all the different meetings.

In some of the agile methods such as Scrum, the role of a product owner exists. The product owner is the person who is actively involved in prioritizing the log of what is to be developed and is primarily responsible for understanding the customer's requirements. The business analyst is an expert in how the operations work and they can assume the role of a product owner in a scrum method. Although it is not as straightforward to just jump from being a business analyst to a product owner, the transition is quite possible. In larger projects, the business analyst can assume a role of supporting the product owner by, for instance, being mainly responsible for the backlog.

A business analyst uses, in almost all of his or her work, collaboration, communication, and facilitation. As agile teams progress in their work through collaboration, the business analyst is in a unique position to bring great value by facilitating teamwork and collaboration. In particular, a business analyst can become a very valuable team member by using his or her strong communication skills to make the team comfortable with the stakeholders, such as the customer.

Ensuring that communications are flowing smoothly in both directions is an important value.

Agile methods also focus on reducing waste and ending issues with over documentation and analyses. The business analyst might wish to document the requirements in a procedural manner but will notice that agile does not follow the same idea. Again, the elicitation of requirements is extremely vital and existent in agile methods but not in the same way and manner as with traditional methods. The business analyst simply has to adapt and work with the requirements in the same way as the agile teams (for instance using "user stories"). At times, the agile team might oversee certain aspects of requirement elicitation. For instance, user stories do not capture non-functional requirements. In such cases, the business analyst can contribute with eliciting such important requirements.

When a change initiative is first discussed, the analyst prepares a business analysis plan. As discussed earlier, the plan also considers the approach (predictive or adaptive). If the approach is adaptive such as scrum, the analyst must plan accordingly by focusing on impact mapping and user stories rather than use cases and narratives. As such, the business analysis work done prior to the delivery should be of such character and format to ease the transition from design to the delivery phase.

To summarize, although the role of a business analyst is not included in agile methods, the skillset of a business analyst is highly valuable in agile teams. The main difference is in how these are delivered but that concerns the outer form and format, not the inner core of analysis work. This means that the analyst might not be solely responsible for a certain aspect such as eliciting requirements but rather, see the results being produced as a result of a team effort where the boundaries of each person's roles are unclear. At the end of the day, the agile team including the developers, need to understand the business domain. The business analyst can play an important role by bringing their analytical skills to the team.

Chapter 19
Evaluate Solution

Projects are evaluated in regard to delivering results within the specified time frame and budget. A business analyst evaluates a solution from the perspective of what value the solution brings to the business [3, 139]. Note that the evaluation is not about the implementation of the solution. It is about evaluating the impact on the business. The evaluation concerns, if and to what extent the objectives have been fulfilled. If the solution does not produce the gains that motivated the investment to begin with, the solution has little value. In fact, the funds invested could have been better spent on other projects. Furthermore, the business will continue to suffer if the problems identified are not resolved.

Evaluation is not as simple as it may appear. An important input to evaluation is the results from both the current and future state analysis. In particular, metrics are of importance. In this chapter, we focus on evaluating a solution once implemented. An input to the evaluation is the intended value of the solution. Furthermore, the analyst has also ensured that the required data for evaluation is extractable. Evaluation of a solution usually includes the following aspects. Firstly, the analyst needs to determine the best way to assess the performance of a solution and analyze the results. This is a continuation of the work performed earlier, where the objectives were defined, and goals set. Secondly, the analyst might wish to assess the limitations, both within the solution and within the company, that might restrict the full realization of the value. Finally, the analyst will take a closer look to identify and recommend actions that can increase the value delivered.

19.1 Measure and Analyze Solution Performance

Before any analysis can be made, there needs to be defined performance measures. The analyst will have to collaborate with stakeholders to find relevant measures. As mentioned previously, this should not be done at the time of the evaluation but prior to the delivery of the solution. As discussed earlier, performance measures are

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either quantitative or qualitative. An analyst who has considered what aspects are to be evaluated, ensured their relevance to strategic objectives, goals, and having gained a solid understanding of what processes contribute to the goals, is in a stronger position to perform good evaluation. As mentioned before, the evaluation can be done via KPIs, customer-based metrics, sales and marketing-centered metrics, operational metrics or even in some cases, checking that certain functionalities have been delivered.

Part of the work is to collect data relevant for measuring the performance. If the analyst does not think of data collection in early stages of the analysis process, there might be a risk of data not being accessible when measuring the performance. In defining and collecting the data, the analyst will need to consider the volume or sample size. If the available data is too small, the result will most likely be inconclusive as it is based on a weak foundation. Therefore, larger sets of data are more reliable but on the other hand, it might be difficult to process. As in many other cases, the golden middle way is best. This aspect further emphasizes the importance of considering the evaluation early on rather than at the end of the project.

Another perspective to consider is the frequency and timing of the data. Will measurement data collected over for instance, the past 3 months be reliable? It will depend on the context and the industry. If the solution is within a context that has seasonal variations, looking at a three months period, might be misleading. Some solutions require more time before their value is noticeable. The reasonable time before value can be expected varies between solutions and as such, the time perspective is a relevant consideration when collecting data. Finally, the "currency" of the data matters. In principle, the newer the data, the better. Analyzing performances with old data might be misleading as the environment changes, and perhaps a number of internal process have been modified over the years.

Once the measures are clear and the data required collected, it is time to analyze the performance. As mentioned before, when having a target or predefined goal, the analysis is done against the metrics previously developed and defined. Let us look at an example where a problem is with delays. Let us assume that a company processes 200 orders per day. However, the growth of orders was increasing, and estimates indicated a volume of 400 orders per day in the near future. One option is to double the staff but would be costly. The best solution is perhaps to implement an information system that supports automated order processing. The metrics can be to manage 400 orders per day. In addition, cost of order processing can be reduced. The benefits can be summarized as follows:

1. Manage 400 orders per day (scalable solution)
2. Reduce costs by
3. Less waste (10% reduction)
4. Less staff (50% reduction) for 400 orders
5. Shorter time per order processing (20% reduction).

In order to evaluate a solution, it is necessary to know the values of the metrics for the current state. These values are already elicited. It is also necessary to know

within what time frame the metrics can be evaluated. The objective to manage 400 orders might not happen overnight with the implementation of the solution. It is reasonable that this objective would be achieved within a year of implementation. The increased efficiency from reduced costs might take six months to be fully realized, as staff would need to become familiar with the new processes. Furthermore, it might take six months for many of the staff to find other positions within or outside the company (reducing staff levels by 50%).

19.2 Assess Solution and Enterprise Limitations

The goals might be fully, partially, or never fulfilled. If the goals are fully realized, it is a success. However, if they are partially fulfilled or not at all, there might be a limitation that hampers the realization of the value. Such situations must be analyzed. In most cases these limitations are either within the solution itself or the enterprise in which the solution is implemented. Wherever the cause lies, it needs to be analyzed.

The first step is to identify dependencies. Solutions can consist of several dependent components that work together to make it work. If one of the components is not working properly or two components don't work well together, the value delivery of the solution might be compromised. The value being produced might be limited by the "weakest" component. It is therefore essential to understand why the solution is not delivering the expected value. The reason might not be in the solution but in the enterprise. As mentioned previously, the solution itself might be perfect but there are other aspects (as discussed with POPIT) that must work together to enable value delivery. Perhaps certain units of the enterprise are not using the new solution correctly, perhaps they have not received adequate training, or they have other issues restricting them. In short, the problem might be within the solution or within the context of the solution implemented.

Once the problem is identified, the work to find possible solutions begins. When finding alternatives, it is important to assess the impact of the problem. Is the problem of such magnitude that it must be addressed, or could it be postponed without any significant impact? What is the level of priority? If a solution to the problem is prioritized and implemented, what impact will it have? Are there any risks associated with the solutions or with not doing anything? These and related questions will be important to consider before moving on. To summarize, there are several directions that can be taken, do nothing, change something or retire the solution:

- **Do nothing**—if the impact or the value of a change is low, and the cost of doing something will exceed the value, or if risks associated with doing something are high, then it is probably best to simply do nothing and let it stay as it is.
- **Organizational change**—it might happen that the solution is good enough but for various reasons, the solution is not well received by the organization.

A solution might require new skills, eliminate jobs, introduce new issues or other organizational barriers. In such cases, the solution does not necessarily need to be changed but focus should be directed towards organizational issues.

- **Change the solution**—it might be that the solution is unnecessarily complex in its user interface or has too many steps that do not add value. Perhaps some functionality is lacking, or further capabilities have been identified that would make the solution better. In such cases, it might be good to enhance or reduce the complexity of the solution in order to make it more complete and easier to understand.
- **Retire the solution**—it might be so that the solution was simply not good enough or that changes in the environment rendered the solution redundant. In such rare cases, perhaps the best option is to retire the solution.

19.3 Continuous Monitoring

Evaluation of a solution is not a one-off event. The time frame for a specific metric might be set for one year but that is not the same as evaluating that metric after one year. The metric should be evaluated regularly at appropriate intervals such as weeks or months depending on what is being measured. By following the development of the benefits the solution is bringing, the analyst can quickly respond to a variety of cases.

- If there are no improvements after one or two intervals, the analyst can examine the reasons why.
  - If it is a question of delay, the analyst can identify the reasons and initiate measures can be taken to remove them.
  - If it is a question of no benefits being produced, there is something wrong. Either the solution is inefficient or something in the implementation (the business unit that received the solution) is missing. The analyst can examine and either salvage the situation or add what is missing.
- If the progress is going as expected, the analyst can examine the situation to see if there are any improvements or measures that can be taken to improve the benefits or speed up the realization of benefits.
- If the progress is going better than expected, the analyst can investigate as to what factors are contributing to it. Perhaps lessons can be learned, and measures can be taken to continue the improvement.

In essence, evaluation of the solution aims at securing and measuring that the intended impact is achieved. If the impact is not achieved, the work of the analyst is not over. As the objective is to have an impact, the analyst has to find and resolve the issue. If the solution delivered the intended impact, the analyst can rest assured of a job well done and begin working on future changes.

19.4 Evaluate Digital Solution

Evaluation of digital components and solutions follow the same principles. In fact, it is not different in why it is done, but slightly in how. For digital solutions, the benefit is the availability of data. If the analyst has been proactive in the design phase, the data needed will be readily available when evaluating the solution. By this time, issues such as data quality, format, and other aspects discussed previously in regard to data value chain, have been taken into consideration. Furthermore, metrics and reports needed have been incorporated in the body of requirements, allowing for easy access to results. In such cases, evaluation should be quite straightforward. In other words, the analyst who considers evaluation long before the actual evaluation takes place, will have few, if any issues with this last stage of the business analysis process.

At times, the analyst might wish to further analyze the data gathered after the implementation of a solution. Given the availability of data, perhaps additional analysis can be conducted to learn more about how the solution is delivering value. It might also be the starting point of the next improvement imitative. For instance, many analytical tools allow for real-time data monitoring. Most modern data and process mining tools include some form of data visualization that present the data in dashboards. Such dashboards give a real-time measure of metrics. For evaluation purposes, such dashboards can be valuable in the continuous evaluation of a solution.

Chapter 20
Guiding Principles for Business Analysts

The business analyst will use tools to achieve many of the results required for successful analysis. There are many tools such as process models, UML diagrams, SWOT analysis, and data models available. However, one must bear in mind that these tools are just that, tools. While they are indispensable, valuable, and highly effective, they are tools. The results that are to be achieved, the business value to be created, or the solutions that need to be designed is what matters, not the tools. Let us assume that you are very handy and decide to renovate your kitchen. You draw up the design, buy the materials and start the renovation work. When you have completed the work and you have a new, fresh, modern kitchen, you invite your friends for dinner to celebrate. Your guests will comment on the design, practicality, functionality, and appearance of your kitchen, not on what kind of hammer you used or if the screwdriver was made in the US or China. Similarly, if you work on a project that failed, your manager is not going to say that it does not matter because the UML diagrams and the process models you created are just magnificent. Likewise, if you deliver a project successfully within time and even exceeding the expectations, few will question the results based on what tools you used. The result matters, not the tools although the tools are essential in achieving the results.

There are many tools available and it is not practical for an analyst to be skilled in all of them. There is a certain degree of overlap in the purpose and use of some tools and the analyst might use a certain set of tools that they are more comfortable with. The analyst should not become too dependent on specific tools. The problem with becoming too attached to a limited set of tools is the so-called "law of the hammer." The law of the hammer states that "if all you have is a hammer, everything looks like a nail." This could be very limiting for analysts and perhaps even result in below par analysis and results. The work of an analyst would be principle driven rather than tool focused. With such a mindset, the tools are always at the mercy of the principles. It is difficult to list and define all principles that could apply but some stand out as they are general and apply almost every time. The main guiding principles for analysts are as follows:

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- **Entire Life Cycle** – not only requirements or the project
- **Seek Root Causes** – not symptoms
- **Creative Solutions** – not always the same procedures as before
- **Improve the Business** – not only IT systems
- **Customer Perspective** – voice of the end user
- **Feasibility** – feasible solutions that work, not perfection
- **Mediation** – non-conflict or conflict avoidance

The above listed principles are particularly relevant for the digital business analyst. Digital analysts work in environments where change is the new normal. In such dynamic and evolving atmospheres, one cannot be limited or rely too much on tools and methods but rather be guided with principles. These principles are core to successfully understand and use digital technologies to create better solutions. Before elaborating on each of the above principles listed, let us examine a case study that exemplifies how the principles can be illustrated and are relevant within the context of analysis work. Although the example is not digital, it serves to shift the focus from replacing technology to creating value.

20.1 New System Versus New Structure

Consider the following case. An investment bank is experiencing tougher competition from competitors. The bank has been one of the major players but is now seeing its market shares decrease. The bank offers complex financial instruments that are tailor made to the needs of institutional clients. These products have a high profit margin and as they are tailor made, require a high degree of innovation. A significant portion of such trades are "hot" for a short time while they are new. Such high profit margins last for about 6 months after which, the products either dies out (traded in very low volumes) or becomes common and as more banks offer them, the margins decrease. The sooner the bank can become fully operational with new products it can take a bigger piece of the market and enjoy lucrative profits. Time to market, i.e., the time it takes from an idea to making the product tradable in significant volume is crucial and is directly related to profitability. Another reason for decreasing revenues and profits is that international banks have entered the market and offer the same type of products. Their back-end solutions are more adapted to such products and they can, therefore, introduce new products faster (shorter time to market).

The managers are not pleased with this development and have recognized that if nothing is done they will no longer be profitable and perhaps be out-maneuvered. Not wanting to lose their strategic advantage, they begin discussions to identify the problem and how it can be solved. The structure of the current solution is as described in Fig. 20.1.

The traders have a front-end system where they register their trades. Not every trade is registered immediately. Trades are registered preliminarily and several

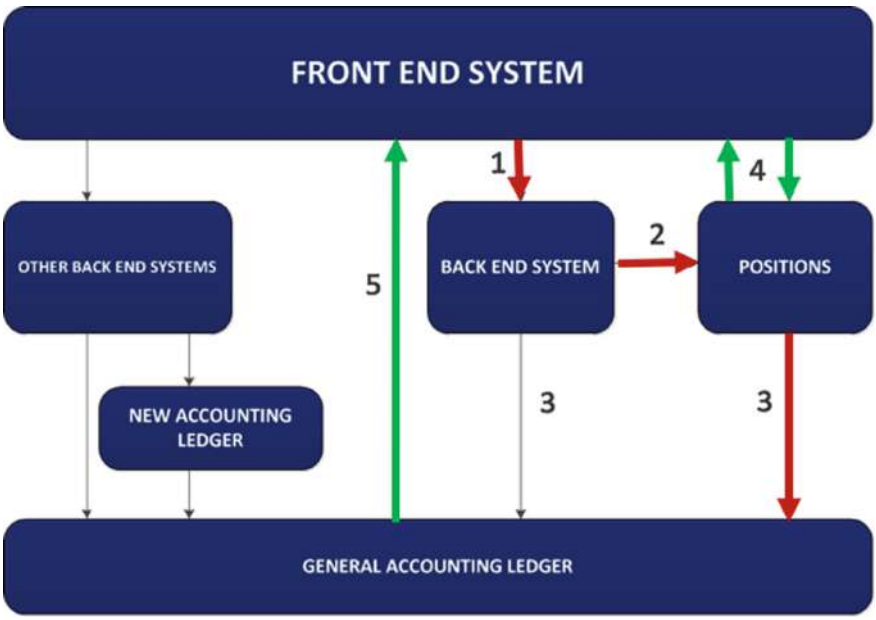

Fig. 20.1 Current solution

changes are made before they are finalized. Once the trader considers the trade to be finalized, he or she registers it. The trade then goes to the back-end system (see Fig. 20.1 step 2). At this point, the trader cannot make any changes without involving the back-end. The back-end is managed by a separate department and their main responsibilities are to confirm the trade with the counterpart, ensure payments are entered and executed, and reconcile the trades between the two systems. The back-end system does not hold positions meaning that they cannot see the current positions of currencies or counterparts. The back-end system simply receives the trade and sends it further along the chain. There are historical reasons for this. Initially, the back-end system was built to manage other types of financial products. To reduce interface work, it was decided, as a short-term measure to put the complex products into this back-end system. Unfortunately, as often happens, the temporary solution became a long term one. The back-end system, therefore, sends the transactions to "positions" (see Fig. 20.1 step 2) which will send the transactions (in an evening batch) to the general ledger (see Fig. 20.1 step 3). Likewise, the back-end system sends data directly to the general accounting ledger. Given this solution, it is important to ensure that the front-end system, the positions, and the general accounting ledger have the same transactions. This is secured with reconciliations between the systems (mostly manual with the aid of reports) which are very time-consuming (see Fig. 20.1 step 4 and 5).

The management team identified three main problems with the current situation. First of all, the time to market was too long. On average, it took four months to get a

new product in place. Considering that the "hot" market only lasted about six months and that most products would die, such long implementation time made most cases unprofitable. Competitors had time to market of about two weeks which gave them a competitive advantage. Furthermore, the processes at and around the back-end system were largely manual and as such, put limitations on the volume of transactions that could be traded. The front-end could make more trades but due to this limitation, they had to turn down profitable opportunities. Finally, the reconciliation between the systems required many hours of work from the front-end, back-end, and the accounting department. This was costly and when traders became involved, they lost opportunities to make deals with clients.

The management team saw the lacking functionality of the back-end system as the main problem. This system was about 15 years old, and updates required a lot of coding and testing. Furthermore, the lack of functionality had to be compensated with manual processes which limited the volume that could be managed. In addition, as the system for positions was old and difficult to work with, many issues arose with the reconciliation process. The time it took to investigate, and correct errors was quite high.

To address these issues, the back-end had to be replaced with a modern system that carried the required functionality and could manage such products. It was clear that such a new back-end system could not be built in-house and therefore, it had to be bought off-the-shelf. Furthermore, work had been conducted to create a new accounting system. This new system was designed to be more flexible than the general accounting ledger. As this was an infrastructural system, the new back-end system had to be connected to the new accounting system (see Fig. 20.2).

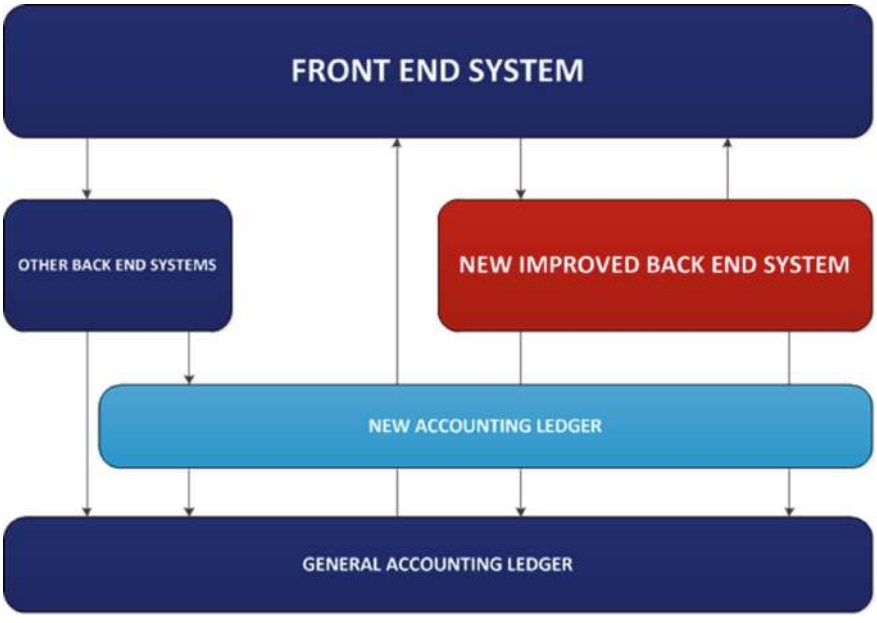

Fig. 20.2 New proposed solution

With a new back-end system, the following objectives were set.

- Reduce the time to market from the current 4 months to 2 weeks.
- Increase the volume by a factor of 3.
- Reduce time spent on reconciliation from 80 hours per month to 40 hours per month.

A team of analysts and resource persons from relevant departments were put together to find and evaluate candidate systems to replace the back-end system.

20.2 Principle 1 – Consider the Entire Life Cycle

As an analyst, one can be given a specific problem to analyze and solve but it is important to view the entire life cycle. Although it is very comfortable for an analyst to work with a very specific and well-defined problem, one should not get "locked" into that specific part. As we discussed before, the end result matters more and if a specific part is done perfectly but does not correlate well with other parts or deliver the value that is expected, it does not matter that much. Considering the entire life cycle mainly covers three aspects of analysis work:

- The first is to extend the view beyond the requirement elicitation step of the business analysis process. Considering the entire life cycle has the implication of considering the steps before and after the requirement elicitation step.
- The second aspect concerns the entire process of the problem area rather than becoming too focused on the specific area being investigated. In essence, it refers to the context in which the problem area exists and by considering the processes before, after, and those adjacent to the specific problem area being investigated.
- Finally, considering the entire life cycle extends beyond the project in hand by looking at the "after-life" of the project.

A word of caution. When considering the entire life cycle, it does not mean that all parts are included in a project or initiative. It merely emphasizes the consideration of the entire life cycle but naturally, decisions need to be made to define the scope. However, it is better to consider the entire life cycle and then consciously exclude parts rather than beginning by excluding parts and later recognizing the inadequacy of the scope definition.

20.2.1 Considering the Entire Business Analysis Process

The business analysis process has few steps, but the majority of the work is eliciting the requirements (design) and delivery of the solution (see Fig. 20.3). This is quite

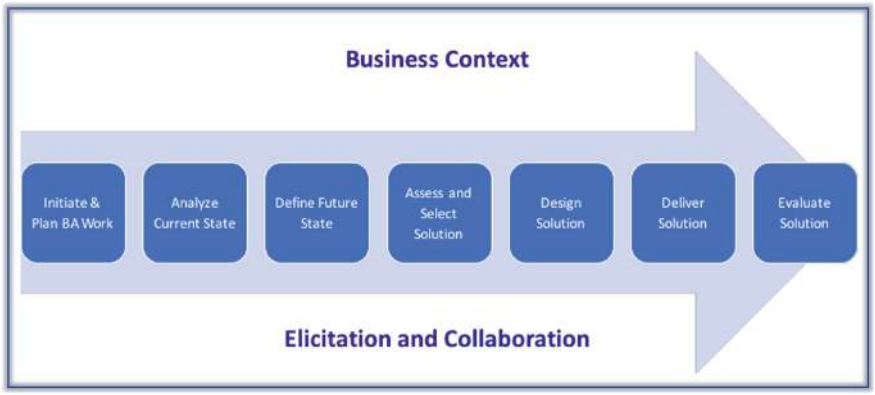

Fig. 20.3 Business analysis process

natural considering that once the preparatory analysis has been conducted, the main work is the design and delivery of the solution. When working for long periods with a specific part of the process, it is easy to get stuck in the details and lose the connection with the previous steps. Considering the entire life cycle of the analysis work entails reminding oneself of the motivation of the initiative, re-visiting previous stakeholder analysis, current and future state descriptions, and problem analysis when needed and making amendments if required. The analyst that operates in such a mode can zoom out to see the whole picture and then zoom in to a level of detail to ensure they are still connected. Perhaps the analyst operates like Google Maps where you change the view from country to street level.

Another aspect often neglected, is the evaluation of the initiative. A successful evaluation does not only depend on knowing how to evaluate the impact of a solution, but also on the availability of data to enable such evaluations. Let us assume that a customer registration process is cumbersome as there are many steps and some data have to be entered several times. If the project's aim is to reduce the registration time, it can do so by either re-designing the registration process or reducing the mandatory data needed to be entered before proceeding, thus making it voluntary rather than mandatory. Regardless of the solution, the aim is to reduce time spent on customer registration. A successful evaluation of such a project is not necessarily based on how much data is entered, or how many customers register but rather, the average time it takes for a customer to register. In order to evaluate this, the analyst must make sure that the data required for such analysis is included and extractable. In this case, it might be the time-stamp. This might seem trivial, but one can go a step further. Instead of only measuring the time by extracting data about when the registration started and ended, we can examine how long it took the customer for each step of the registration. Furthermore, we might want to know more about how many customers started the registration but did not complete it, or at what stage of the registration process they chose to discontinue. These aspects can be seen as part of the evaluation of the solution, not only for how well it

performs but also to enable data-driven improvements in the future. For this we need more refined data that extends beyond simple start and finish times. Having the entire life cycle in mind enables the analyst to ensure the required data is provided so the solution can be assessed, and future improvements made.

20.2.2 Considering the Entire Process

Prior to the start of an initiative, there is often a perception of what areas need to be investigated. Naturally, there is a tendency to focus on those areas early on. This is logical because those raising the issue are domain experts and as such, have enough knowledge and experience to make such statements. However, there are some limitations. Firstly, the problem area might be connected or even caused by activities earlier in the process. It might be that the problem being perceived is actually not the real problem but just a consequence of something happening earlier in the process. Secondly, being too focused and creating solutions for a specific part might cause issues later on in the process. Finally, having a too narrow perspective of the problem might restrict the analyst from seeing other opportunities for improvements and limit the solution (and the investment) in how much value it will bring.

In order to avoid these pitfalls, the analyst should adopt an "entire life cycle" perspective of the process. This means that the analyst will consider the whole process, beginning at the very start and finishing at the very end. This might prove to be a challenge as it might not be clear where the beginning is or where the end is. Consider the following example. A theme park has grown beyond its capacity and the lack of physical space is restricting its expansion. The situation causes very long queues for the rides, overcrowded restaurants, and stores, leaving the visitors complaining that most of the time was spent queuing rather than enjoying their visit. In solving this problem, it is easy to consider the processes at the theme park and focus on solutions that will reduce the delays or improve the space utilization. With such a scope, the starting point of the process has implicitly been set to when the visitor enters the theme park. However, considering the entire process and beginning with the very start, the process would begin when potential visitors seek information or enter the web page. If the starting point is set to when the potential visitor enters the website, the possible solutions, and their impact will be significantly higher and more valuable than just focusing on when visitors enter the theme park. Setting the starting point earlier does not discount the solutions for the physical theme park but can open up additional opportunities and allow for integrating the solutions to increase the value. An example of this is how Disney World uses "magic band" to enhance the experience for their visitors and gain higher revenue per visitor [189]. In this solution, visitors buy a book of tickets for their favorite rides, make their wish lists, and pay their entry fee in advance. Once in the theme park, the "magic band" combined with mobile app, gives them suggestions of rides to take (where queuing times are less) and gives notification, based on their

location and the rides they have put on their list, when it is their turn to go on the ride. By using digital technologies, the visitors spend less time queuing, have more time to spend money, and enjoy their experience at the theme park much more.

In the example of the bank we looked at earlier, several departments, each with their own processes were involved. It would have been easy for each department to focus on their own processes and when finished "hand over" to the next department. This would most likely lead to sub-optimal processes because the entire life cycle is not being considered. Looking at the whole process, beginning with the first customer interaction, enables the final solution to be much more efficient. During the analysis, it was found that the same data is being entered several times. Although each time was for a specific purpose, it was still multiple entries of essentially the same data. Furthermore, by viewing the entire life cycle, it became clear that traders were using their front-end system slightly differently from what they were supposed to do, and this deviation caused several minor issues affecting the accounting department.

By considering the entire life cycle of the process, the analyst can secure a better understanding of the issues at hand, unravel additional opportunities for improvement, and ensure that the solution is in sync with the downstream processes. If nothing else, it gives the analyst and the team working on the initiative, a common and better understanding. Considering the entire process does not necessarily mean that all opportunities need to be incorporated in the initiative. That is a decision taken separately, but it is better to know about issues and then prioritize rather than discover issues later on and forced to exclude them due to time or cost limitations.

20.2.3 Considering the Entire Project (After Life)

Projects limit their scope to what they are to deliver, which is quite natural and healthy for a successful project. The analyst, on the other hand, has a wider perspective. Project success is not necessarily the same as business objectives. Projects are often evaluated based on time, cost, and quality. They are measured based on how well they delivered their deliverables within the scope of time and cost. That is not necessarily the same as the effect, impact, or value to the business. As such, what happens after the project concludes, is something that the analyst should have in mind.

Sometimes the project is part of a larger initiative and in such cases, the analyst should be aware of what the next steps are. If the focus becomes too narrow on the current project, it is possible that the solutions will not be aligned with the needs of the next steps or future projects. Being aware of what is required as part of future projects after the project finishes, the analyst can ensure that any preparatory work needed is included, and that solutions do not impede future plans.

In the banking case introduced earlier, the overall plan was to set the foundational infrastructure. The plan, in the first project, was to begin with products that are traded in lower volumes. Following a successful implementation, the next steps

were to include additional products. In designing the solution, the analyst was aware of this. However, as they had not investigated what the other products would require, part of the solution was developed for the first set of products. After the project, when work began with the second set of products, it became clear that these products required a different solution. The reason was rooted in the fact that the first set of products was traded with larger corporations and institutional clients. However, the second set of products was traded mainly with small businesses that did not have the same capabilities as the larger corporations. Therefore, those trades required a different approach. Failing to see this earlier caused unnecessary costs and additional work. Had the analysts, prior to designing the first solution for the first set of products, spent a day or two investigating the products that were to follow in later projects, much time and effort would have been saved in the following projects. As such, it is important for the analyst to be mindful of future projects and needs.

Sometimes projects are isolated and not part of a series of projects and viewing the entire life cycle by considering the afterlife of the project is not the same as discussed above. However, the analyst can discuss and analyze what could be extensions that might be interesting to implement after the project is concluded. It could be additional functionality, connecting to other systems or services, or as simple as functionalities that were cut from the scope of the project. It is worth considering these points and what could be done in order to facilitate such enhancements.

20.3 Principle 2 – Seeking Root Causes and Not Symptoms

The definition of a business analyst, as discussed earlier, is bringing about a change that delivers value by solving a problem or satisfying a need and recognizing what are those problems and needs. This is not as simple as it sounds. One can easily get caught up in the symptoms rather than finding the root cause. The analyst has a great responsibility of seeking out the root cause. If the root cause is not addressed, the problems will not be solved. It is possible to relieve the situation by addressing the symptoms, but it will not solve the issues and therefore, the problems will resurface.

Let us revisit the banking example. The three main objectives were to reduce the time to market, reduce manual work, and significantly reduce the work associated with reconciliation. If we take the first issue, reducing the time to market, we need to find the reasons. Asking the question of why it takes three months to get a new product in place, will give many answers. Among them are that the IT department is not skillful enough to handle these kinds of products and projects, the process for prioritizing projects is inefficient, it is difficult to get funding, the IT resources are limited and used by several IT systems and therefore create a bottleneck, the

back-end system is old and not easy to update, or that the many interfaces make the testing very time-consuming. While these reasons may be valid, the question still remains. What is the root cause? Would restructuring the IT prioritization really speed up the time to market? Are these explanations reasonable? These seem to be symptoms, or, aspects first encountered by those who experience the problems.

Let us examine the reasons relating to the IT prioritization and resources. It is natural that these reasons are given because when traders wish to add functionality to the IT system, they are told they have to prepare a memo to be discussed at a certain prioritization meeting. In these meetings, all the different requests are evaluated and prioritized. Naturally, if other projects are more profitable, they will be selected. As the time to prepare memos and have them assessed, takes time, traders think this is the reason why the time to market is long. However, if it was possible to start development on the same day, would that solve the problem? It would probably not solve the issue because the requirement elicitation, development, testing, and deployment will require more time than the set target of 2 weeks. The analyst examines the reasons given, examines the facts, asks questions, challenges assumptions, and applies his or her knowledge and experience from other cases to unravel the root cause.

Let us look at the other reason, namely that the IT system is old. There might be good cause to accept this explanation. The IT system is old and developing it to manage additional functionality is tricky and therefore time-consuming. So, would a new system solve this issue? It would because the new system would have all the functionality required as standard. However, what would happen in a few years? As new products are created, would the new system cope with the development? If this is possible (through updates from the vendor), it will still take longer than two weeks because updates need to be planned, customized, and tested. If the IT department is going to develop the new functionalities, then it will take time to elicit requirements, developing, testing, and deploying the new functionalities. This would also take more than two weeks. So, these explanations seem to be symptoms rather than root causes. By deepening the investigation and analysis we are getting closer to the root cause. Further work on this issue revealed that the root cause for the delay to market was the fact that the same or similar functionality had to be replicated i.e., developed in several IT systems. Regardless of how good a system is, if it needs to be developed, it will take time. As long as there are several systems that require some form of development to manage new products, there will be a longer time to market.

Likewise, the reasons given for manual work and reconciliation were symptoms rather than root causes. The high degree of manual work was also attributed to the IT system. This is a classic mistake. Changing the system might improve the situation but if the root cause is not the system, the issues will re-emerge but in a different way. In this case, it was interesting to note that the same back-end functionality was conducted by adjacent departments with a very high degree of automation. The other departments did not necessarily have much better IT systems, but their process was better. The analyst, therefore, redirected their focus from lacking IT support to the business process. The root cause, as it turned out, was not

lacking IT system but rather that the IT system used was not the right one to support the business processes. Other systems already in place could do the same work much more efficiently, although differently.

The root cause of why the reconciliation was time-consuming did not have to do with bad reports, manual routines, or with the fact that there were many systems to reconcile between. In this case, the analyst must be inquisitive about the reasons why the numbers differ between systems. That is where the answer lies because even with the best reports, there are still differences. It turned out that the different systems used data from various sources and there were subtle changes in the way they categorized different transactions. As such, the numbers were different and as they were labeled differently, it was difficult to find the same transaction in the various systems.

The examples above serve to illustrate the importance of finding the root cause. If the symptoms are treated, the root cause will persist and sooner or later, new symptoms emerge. Later, we will discuss root cause analysis, but the analyst must be conscious of this principle, i.e., to see beyond the symptoms and seek the root causes.

20.4 Principle 3 – Creative Solutions

Seeking creative solutions should be part of the DNA of an analyst. The value that analysts bring is in finding the best solutions to every case. Analysts are not always given the most exciting and novel cases but often, they find themselves applying the same solution to a different but similar case. This is part of the daily life of an analyst but that does not discount creative solutions. Even in such cases where the analyst is applying the same solution, there are two reasons why they need to be creative. The first is that business analysts are hired for their analytical minds, not for routine implementation or following instructions as if it was a recipe. The second reason is that any solution, however good it is, will become a bad solution. A solution is only good in relation to the context in which it is implemented but with time, many things change, and good solutions become outdated.

The principle of seeking creative solutions does not have to be ingenious innovations. The work an analyst does is to understand the current situation, find the root causes, discuss and gather facts, information, and perspectives. These are all part of being creative, for creative solutions must be based on and conceived from a solid foundation. Furthermore, even if the same basic solution is implemented in different contexts, the creative analyst will actively seek ways to improve each implementation and make it better than the previous one. He or she will endeavor to make each implementation more suited for the context and better prepared for the immediate future.

Being creative is not as difficult as it sounds. It does not entail finding original, innovative, and unique ideas. In fact, there are many available sources that offer a wealth of ideas, inspiration, and experiences. Many consultancy firms such as

McKinsey, Accenture, Bain & Co, PwC, Gartner offer publications such as newsletters, reports, case studies, and surveys. These are a few of the larger international consultancy firms however, there are a number of more specialized consultancy firms that also offer many insights. Other sources that can offer inspiration to the analyst include - off-the-shelf product retailers - visiting competitors - and attending workshops, conferences, seminars, and webinars. These sources do not offer readymade solutions that the analyst can simply copy and paste. Rather, they offer insight, experiences, and case studies that the analysts can take as input to their creative process of finding the right solution from their own initiative.

Creativity is no more than seeking, being inspired, adapting, and putting together solutions that fit the context of the initiative the analyst is working on. Let us return to our banking example. The focus had so far been on replacing the old back-end IT system. However, the analyst read up on the trends, checked out their leading competitors, had discussions with several vendors to find out what kind of ideas they had for their products, what their other customers required, attended conferences and so on. It became increasingly clear that the future was not in having separate IT system for the front and back-end but rather in merging them and having one integrated system that offered both front and back-end functionality. Not only were top performers moving in that direction, but vendors had initiated projects to integrate their front and back-end systems. This creative inspiration changed the focus of the analyst from finding the best replacement system to looking at existing front-end systems to examine if any could be enhanced with back-end functionality. Needless to say, this emerged as a new possible solution (see Fig. 20.4) that was very different from the previous direction.

20.5 Principle 4 – Improve the Business, Not Only the IT Systems

IT solutions aim at improving the business and IT systems regularly play an important role. However, the value is not delivered automatically if a new IT system is implemented. If there is a bad process or structure, it will remain this way even if it is supported by a very good IT system. Changing an IT system does not necessarily improve the process or the structure. This is a lesson we have learned from history. In the 1980s and 1990s, the coming of age of client-server architectures and the Internet made it possible to automate a wide range of business processes. However, businesses learned that process automation *per se* rarely produced significant value. Instead, the value of business process automation came from the fact that it enabled fundamentally new business process improvement opportunities – such as once-only data capture (using shared data stores), automated business rules checking, and online self-service. Likewise, analysts' solutions work with delivering value, but that value lies not so much in its technology substitution

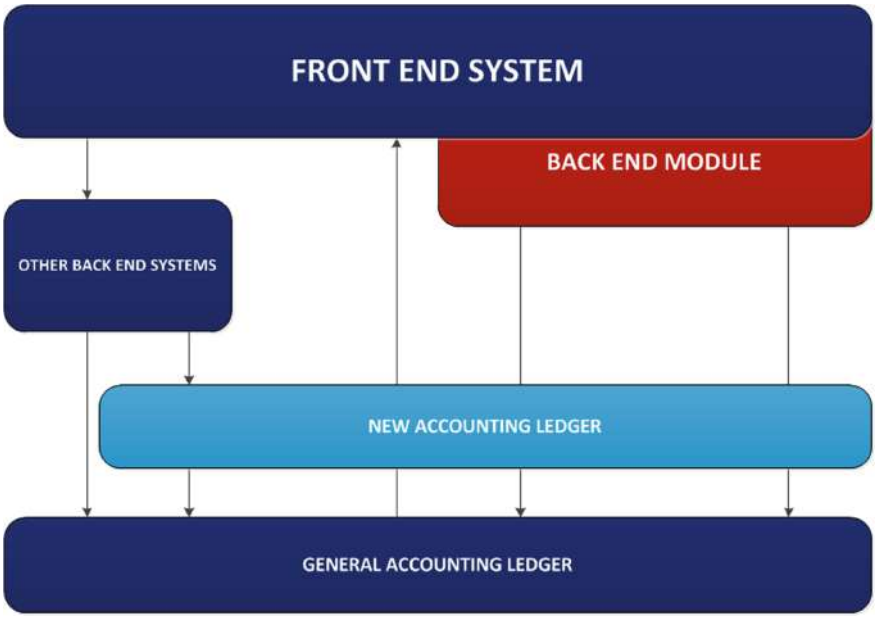

Fig. 20.4 Integrated front and back end solution

ability, but rather in its ability to enable new business process improvement opportunities. As an analyst, one should not forget this principle.

Let us again return to the banking example. If we examine the objectives, we can discern that the analyst working on defining them might have been caught up with replacing an IT system rather than improving the business. The first concerns reducing time to market and implicitly, it is about developing a new system. The second and third objectives, reducing manual work and time spent on reconciliation, are also IT system focused as more automation is implicitly dictated. If we look at the business aspect and discard the IT perspective, we realize that the objectives should be more "business-oriented." and not market dependent on any other department besides the trading department. Following the same pattern, a relevant question is why are there limitations on transactions or why is there a need for reconciliation at all? Following this reassessment of objectives, new objectives were formulated. These were as follows:

- No time to market delay due to any department except the front-end (simply meaning that the only time it should take is the time the front-end needs to set up the new product).
- No limits on transactions (the limitation was based on comparing with the current state, which was dictated by a lack of IT system support, but from a business perspective there should not be any limitations).

- No reconciliation (considering that the reconciliations existed due to mismatches, the new solution should be not to assume there are mismatches but rather to focus on removing them).

The above objectives are defined with the primarily focus of improving the business and not directed towards improving the IT systems. The new objectives required revisiting the initial assessment of the situation. The analyst realized that the main improvements must come from changes to the processes. Further analysis led to reframing the problem and the solution. Previously, products were considered to be new if they had specific requirements, and these needed to be supported with corresponding functionality. The perspective from which a new product was considered was based on departments or responsibilities. The back-end and accounting had their own interest and had to consider these aspects of the new product. This way of seeing new products was replaced. Now, the products were considered as a package of components that could be decomposed into atomic parts. This allowed considering new products to be components of old products. Most of the components in new products were actually not new at all and could be managed with existing functionality. With this perspective, the focus on finding a new modern IT system that covered all the different types of products gave way to investigating how the new processes and structures could be enabled by IT. With this fresh focus, existing IT systems were examined, and it was found that most of the functionality required was already supported by existing systems.

20.6 Principle 5 – Customer Perspective

Business analysis is about delivering value to stakeholders through solutions. Customers or end-users are stakeholders, but their voice is not always heard strongly enough over sponsors or other more powerful stakeholders. A business analyst should consider the perspective of the customer or end-user. This is not always simple. Consider a solution that will be used internally. As such, the "customer" might be a department, but the end-users are those working in that department who will actually use the new solution in their daily work. Occasionally, one or two of those end-users are involved in the analysis process and the project. However, it is not always certain that these representatives have the knowledge or that their preferences are the most efficient. The analyst should ensure that the best solutions are given and not the ones conforming to the input given by the end-user representatives. This does not mean that the representatives are questioned in all their opinions but rather that the analyst considers that they are not always right. The customer is not always right, and the analyst should help customers find the best solutions. By helping the representatives with the aid of prototypes, wireframes, and other tools that help in understanding the solution, increases the chances of developing good solutions that deliver value to the customers or the end-users. The analyst, in a way, becomes the voice of the customers

or the end-users. The analyst has the perspective of the customer in mind when finding the most suitable solution. This does not only apply to requirements and features of the actual solution or the interface but also to the processes, routines, procedures, and organizational aspects such as roles and responsibilities.

When the analyst takes the customers perspective, he or she considers the value of the solution to the customer or the end-user. This can express itself in different ways. One is "replication creep". Replication creep is when the old ways creep into the new solutions. Representatives of end-users might begin with the intention of finding a new way to solve a problem but gradually include more and more of the old ways. This is at times difficult to combat. Many times, parts of the old ways are very good and often they are not. Sometimes parts of the old way are very good within a given context but not in another. It is not always easy to make that distinction when working with a new solution. The analyst has an important role in helping the end-users to think in new ways to build a solution that delivers higher value.

Let us return to the example. As the workflow was being designed, the processes by which different trade statuses were to be managed became increasingly complex. The end-users motivated it with the many exceptions they have. In one case, a confirmation had three different statuses, each one requiring a manual intervention. The analysts recognized that although the solution would work quite well, all these steps would cause annoyance for the end-users. When the end-users tested the workflow, they felt that it was ok. When testing a few cases, it was ok but when doing the same repetitive task hundreds of times, a day, it became annoying. As such, the analyst had extra meetings to thoroughly examine all the workflows. In re-examining the workflows, the analyst took the perspective of the end-users, considering how they would work with the statuses and how that work could be minimized. In the end, the workflow was reduced significantly. Had this not been done, the project would still have delivered its benefits. The stakeholders such as the front end, the back-end managers, and accounting would have enjoyed the benefits. The end-users would also receive benefits but not as much as expected. With the new workflow design, the end-users gained more value resulting in a slight improvement to the overall value of the project.

20.7 Principle 6 – Feasibility, Not Perfection

Sometimes it feels like the customer is an impatient "wants it all" person. However, this is seldom in line with what they are willing to pay for or how long they can wait. Mostly, it is not a question of wanting it all but rather about fulfilling their needs. As time and resources are limited, prioritization is needed. Some requirements will need to be excluded and the analyst plays an important role in this process. An analyst might easily be dragged down by the flow of prioritizing primarily from a "project perspective." It is particularly important that the analyst avoids this trap because the business value that the project aims at delivering is the

main issue. The prioritization of requirements should not be primarily based on what makes the probability of the projects' success better but rather from a business value perspective. In other words, the requirements that deliver or increase the probability of delivering better or higher business value should be chosen first. Naturally, this requires the analyst to be well informed of the business value. It is therefore important to assess and trace how each requirement creates or is important in creating business value qualitatively and quantitatively.

Sometimes, even if several requirements bring business value, they have to be prioritized. This is part of the reality in which analysts work. However, the analyst must not be too quick to make such decisions. The curiosity and creativity of the analysts should compel them to ask, "how can we bring this value in a different way?" As we stated before, we don't seek perfect solutions but feasible ones. The solution does not have to perfectly fulfill all requirements, just as much as is required by the business. It is easy to develop "tunnel vision" and only "see" the requirements. If a certain requirement has to be excluded from the project, the analyst must at least try to find other ways to satisfy the business needs by simpler or "temporary" solutions.

Let us turn to our banking example. After the objectives had been re-assessed, the principle solution was changed as presented in Fig. 20.5. Rather than seeking to replace the existing system with a state-of-the-art IT system, the focus was moved to the existing vendor who provided the front-end system used by the bank. They were in the process of developing a back-end module for managing transactions, accounting, payments, and confirmations. However, the modules were not yet ready, in particular, the functionality for confirmation was at an early stage and far from ready to use.

Managing confirmation is one of the core functionalities of the back-end so this posed a problem. Rather than discarding the whole system because it lacked a key functionality, the analyst looked for other ways to fulfill this need. Having investigated the matter, the answer was resolved with a simple requirement. A script could produce the confirmations, save it to a dedicated disk, and the transaction could automatically be assigned a certain status in the back-end system. This solution, although not perfect or being the way initially desired, was good enough and could be used for at least a few years. While it did not exactly fulfill the objective of "no transaction limits", it was much better than the current one, and as transaction volumes would not rise sharply within the first year, there was time to implement better solutions as part of the "after-life" of the project.

Another aspect was the insistence of certain analysts that functionalities were required for certain types of transactions. These transactions were in the old system and were still "live" but no longer actively traded. This is an example of getting "tunnel vision" of functionality. This functionality was expensive and did not deliver much value because it only concerned a few old transactions. Following the principle of feasibility, the analysts asked themselves if this problem could be solved in another way. They had a discussion with the manager of the trading division who solved the solution by offering to sell off all positions in these products.

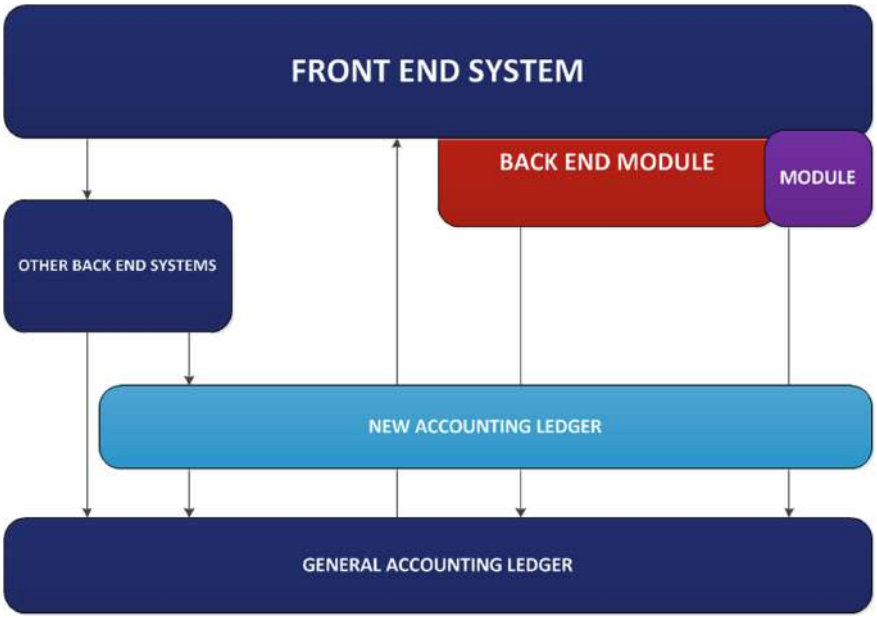

Fig. 20.5 Principle solution

The analyst should be primarily concerned with what and how value is delivered to the business. Questions such as "how does this deliver value?", "how much value will this deliver?", and "is there any other way, perhaps less sophisticated, to fulfill the need?", helps the analyst to stay rooted to the business value.

20.8 Principle 7 – Mediation

The analysts will find themselves in many complicated situations where different agendas, conflicting interests, and opposing perspectives clash. There will always be stumbling blocks. This is the reality of an analyst. It is not the job of the analyst to take sides, get involved in the different perspectives, and pre-occupied with opposing viewpoints. This is rarely helpful. The analyst should avoid getting involved in all sensitive situations. The analyst should first and foremost recognize that opposing views highlight the different perspectives of the issue and welcome them. If a certain perspective is avoided, suppressed, or not properly addressed, it can backfire as there might be something very valuable and important that is recognized later, perhaps too late, in the implementation of the solution.

The analyst will have to mediate in such situations. Rather than taking a conflicting and adversarial role, the analyst should work to build common ground and mediate a way forward that is acceptable to all. As business analysts are

objective and therefore, do not take any sides, they have to rely on facts. By relying on facts, the analyst can remain impartial and let the facts do the work. Naturally, facts alone might not always help but the analyst does not have powers of decision. The analyst is not hired to make decisions that is the job of the managers. However, the analyst does provide the best possible basis for a decision to enable the decision makers to take well-informed factual decisions. This actually relieves the analyst from a lot of stressful responsibility. Naturally, the analyst will take many minor decisions. However, when there are differences in opinion or politics at play, the analysts can stay aloof of such situations and focus on doing their job of delivering the best decisions based on established facts.

20.9 Summary

The eventual solution to the banking case was to use the modules developed by the supplier of the front-end system which was radically different from the initial one (see Fig. 20.6). The solution had a few key elements.

- The first important structural solution was to use the front-end system functionality as much as possible. The front-end had a calculation engine that could

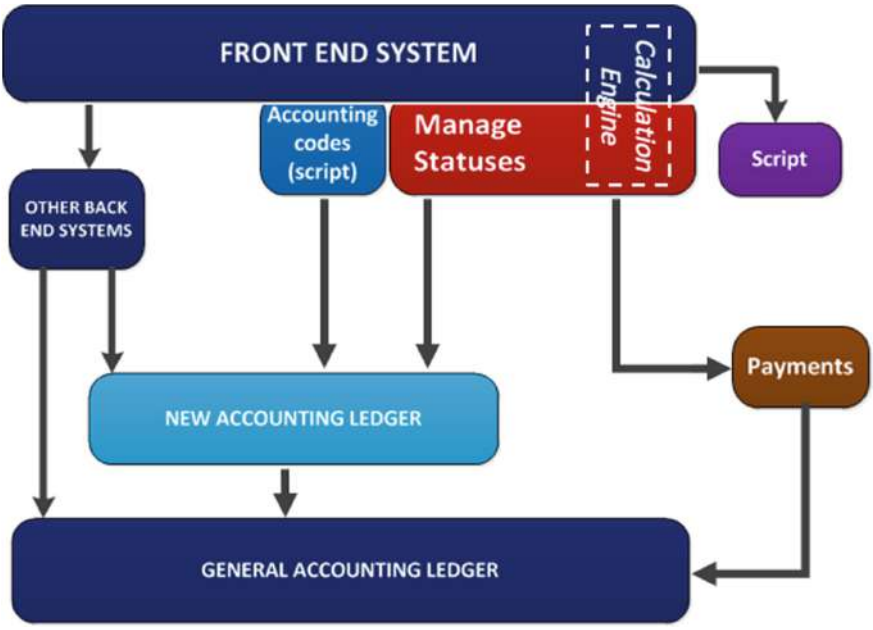

Fig. 20.6 The final solution

be used by the back-end module. In this way, there was one source for calculating all the amounts and that amount was taken as fact.
- Using a script to figure out what accounting code should be assigned to every product. The decomposition of products allowed the accounting to assign a tag to each component and therefore, there was no need to create new accounting codes for every special case.
- The back-end system was simply replaced with statuses that changed as the transactions moved forward in the process.
- The confirmations were created by a script and as they were created, sent, signed, and statuses were updated.
- Finally, the payments sent/received had to be managed. For this purpose, the analyst found an existing system that managed FX payments. As such, this system supported all currencies and had the required interfaces. Rather than integrating separate payment functionalities to all required interfaces, the back-end module was connected to the payment system and payments were affected by routing them through that system.
- The reconciliation was taken care of by itself. The front-end system sent the transactions (via accounting codes and back-end system) of expected amounts. The new accounting ledger received the transactions and sent it to the main ledger. Finally, when the payment came in from the payment system, they would match. As such, there was no need to make any reconciliation. If there were any discrepancies, it would be noted as the debit and credit were different. As it was on a trade basis, it was easily traced to the trade that caused the mismatch.

In summary, the analyst will have many tools at their disposal to achieve the results. These tools are important and indispensable, but the tools must never become ends but always remain as means. By adhering to these principals, the analyst can maintain their focus and not become distracted or bogged down by details.

The banking case study illustrated how a solution can be seen as good but does not really produce business value. Had the solution been to replace the old IT system, the likelihood would have been that after a few years the business would have experienced the same problems but with much higher costs. Being mindful of guiding principles, allows for a solution to be developed that lasts longer and costs less. As can be seen from Fig. 20.7, the difference is significant as are the benefits to the business.

20.10 Reflective Learning

A business analyst performs a wide range of activities in his or her search to recommend the most suitable solution. These activities require competencies, skills, development of new perspectives, building on the knowledge database etc. In other

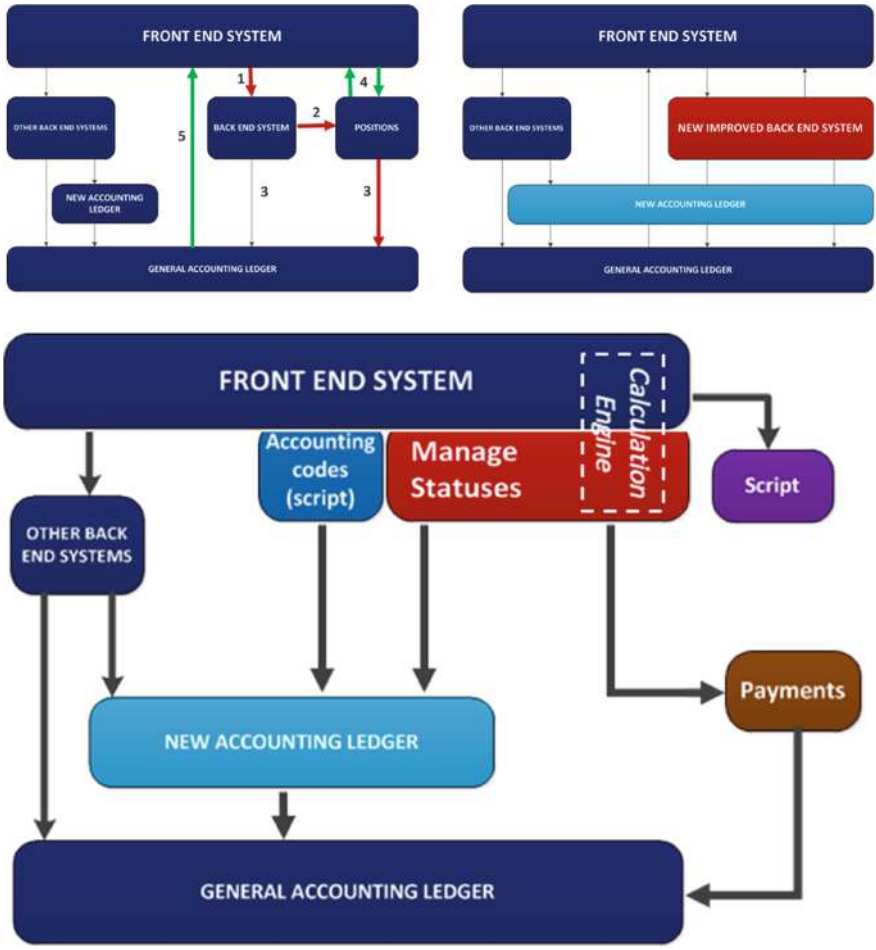

Fig. 20.7 Evolution of the solution

words, the business analyst needs to develop. At some companies, analysts have regular (annual or bi-annual) reviews with their more experienced managers and/or experts. At these meetings, the performance of the analyst is discussed, and a plan formulated to make improvements for the future; including learning a new tool, taking courses, reading certain books and so on. Such plans are naturally individual and will vary depending on the specific situation of the analyst and their level of expertise. As they gain experience, many analysts' work will improve, but further effort is sometimes required. Like everything else, improvement takes effort.

We have previously discussed Business Analysis Performance and Improvement. Such activities aim at improving the overall business analysis of a company. In this quest, metrics are developed that require a minimum number of cases in order to successfully set new goals, outline strategies, and continuously

follow up on the progress of measures implemented. They do not, however, focus on the individual development of the analyst. The annual or bi-annual reviews do not provide enough foundation for frequent and continuous development. So, the question is how can an analyst continuously improve and become better at modeling, eliciting, facilitating, conducting workshops, presenting, and using tools and methods?

The principles of reflective learning allow for "deeper learning" [190] and are best suited for "achievement of more complex and integrated knowledge structures, and more accessible and usable knowledge" [191]. Considering that business analysts work with "complex and integrated knowledge structures", reflective learning in the context of improving as an analyst is fitting. The main idea of reflective learning is to become conscious and thoughtful, as opposed to routine or mindless, when performing analysis work so as to enable learning and improvement. In other words, rather than repeating the same ways, it is about performing the work with a higher degree of consideration for the explicit purpose of learning and improving.

The work of the analyst is made more conscious for the purpose of learning by reflecting on the work recently performed. The idea is not to take every piece of work, every meeting, and every session and reflect on it. Such an approach will not only be very time consuming but also leave little room for implementing what one has learned. It is better to regularly, say weekly or bi-weekly, select a task, a piece of work, session, or something similar that is not too small nor too large. For instance, one might have conducted a full day workshop to model business processes, modeled requirements using UML, have had a series of interviews with different stakeholders, conducted some data analytics, or made an important presentation to clients. These tasks are neither, too small (trivial), or too large (complex), so they are worth reflecting on.

Let us assume that an analyst conducted a workshop to model some business processes. The first step of reflective learning is to describe what one has done. In this part, it is important to focus on the most important aspects. The analyst writes the following:

> *"The workshop was conducted where the participants were seated, and I used a whiteboard to explain the processes. I began with an introduction to business process modeling and then continued with modeling the main process. We began with the first part and explained it in detail. We began with the start event and continued with each activity, until we came to the end of the process. The purpose of the modeling was to create a common understanding among the management team about their processes."*

The second step is to motivate or explain why one chose to do it in that certain way. In this part, the analyst must give thought to the "why." Saying that, because it has always been done in a certain way, is poor motivation. It indicates that it has become routine rather than a conscious choice. The analyst who modeled the processes, motivated it as follows.

> *"I chose to begin at a high level as it was with managers. The workshop format was chosen because the discussions would help create a common view of the process. I used the simple process model elements as the managers were not experienced in modeling."*

The third step is to evaluate. It refers to assessing and evaluating how effective one's choices were regarding the use of tools, models, and approaches (based on what you did). This step also includes a brief explanation about the basis (evidence) one has to support conclusions about the way being effective or ineffective. In the example above, the analyst wrote as follows:

> *"The top-down approach* and modeling each main process was good because the participants got the common understanding (they said so). However, during the modeling several ideas of process improvement came up but were not "captured" properly. Also, at times the model became complex and difficult to follow (it was visible, and some commented on this during the workshop)."

The fourth and final step is to reflect. At this stage, the analyst has captured the description of what had been done, why it was done that way, and if it was effective or not. Based on these steps, one can now reflect on what was good and therefore should be kept, what was ok but could be improved, and what could be done differently next time. The first three steps provide the foundation and information required to reflect and more importantly, identify actionable steps for improvement. The things that are to be kept, modified, or done differently next time, contribute to the continuous improvement of the analysts' work. In the example used, such a reflection might look something like the following:

> *"I would keep the top-down approach* but perhaps introduce another level of hierarchy *to avoid getting complex process models at the lowest level. I would also focus on capturing discussions about improvements by modeling them in parallel with different colors and take note of how it would improve the process."*

As can be seen from the summary Table 20.1, reflective learning builds upon each step. The final result is a set of actionable insights of what to continue to do, what to modify, and what not to do in order to improve learning and make better analysts.

One can also choose to add columns. In the summary Table 20.1, the activity is in focus, however, a column can be added for soft skills. In such a case, the column for activity will focus on the actual work whereas the soft skills capture how a

Table 20.1 Summary of reflective learning

Step	Activity
Reflection	What would you keep (do in the same way) and what would you do differently next time?
Evaluation	Assess and evaluate how effective your choices were regarding tools used, models, and approaches (based on what you did) Also explain on what basis (evidence) you feel it was effective or ineffective
Motivation	Motivate/explain why you chose to do it in the way you did
Description	Write a paragraph describing what steps you took and how you performed these steps (focusing on the most important aspects)

particular situation with a difficult stakeholder was managed, or how conflicting interests between two departments were resolved. At the heart of reflective learning, lies the attitude to learning. To learn, one has to move away from thinking in terms of failures or success and reason along the terms of "what did I learn." If an analyst performs a task and is very successful, it is worth reflecting and to identify which elements were good, what was learned and to repeat those components that made it successful. On the other hand, if it was a big failure, it is equally relevant not to make the same mistakes. In both cases, success or failure, there are lessons to be learned.

Chapter 21
Case Exercises

Base your results on the case study texts. If needed, you are free to make assumptions if (1) the assumptions do not conflict with anything in the text (2) the assumptions are clearly stated and reasonable. Note that there might be stakeholders not listed in this text. Although some exercises are suggested for each case study, bear in mind that all exercises can be done on all cases.

21.1 Merging IT at CusCo

CusCo has been providing insurances to businesses for more than 20 years. They have been around for a long time and they really know their customers. This deep understanding of customers and ability to offer the "right" products have resulted in increasing revenues over the past 10 years. However, with the emergence of new digital companies, they are finding it harder to attract more customers. Seeing a potential for growth, they wish to get more "digital" clients. Tom, CEO of CusCo has invited his friend, Oliver a business analyst, to sit down with the management team and discuss the issue. Below you will find a summary of the meeting.

Lisa, head of sales says:

"We know our regular customers. When we get a lead, we know exactly what to offer and have a very high lead to quote ratio. However, when discussing with digital firms, we simply don't have the same ratio. Traditional businesses and digital firms have basically the same needs but it's the process of getting leads to signed clients that is different. We have our own IT system for our regular clients and we bought out one of our competitors to gain more digital expertise. They have their own IT system that is more "digital", and we cannot afford to have parallel systems. We need to find a way where we have one common IT structure that serves all our customers."

F. Milani, *Digital Business Analysis*,
https://doi.org/10.1007/978-3-030-05719-0_21

Tom added the following:

"Yes, we feel that by merging the two "worlds" a more efficient operation will improve our profitability and quality of service."

Mary, process owner, continues:

"In essence, our process for regular clients begins with us seeking out potential customers. We visit them and book a time. In our preparation, we look at all the available information we have about them, look at what kind of business they have, compare them to other clients that are of similar size, owner structure, markets, profitability and so on. Well prepared, we conduct a first meeting. At this meeting, we discuss how we can improve their businesses. Then we wait for the client to think about our offer. Either they get back to us or we contact them to discuss the offer. If they are interested, which is often the case, we usually negotiate and finally prepare a contract, and have it signed. We also give the customer a specially made gift of medium value to create a sense of a promising relationship.

Digital is quite different. The work with getting leads is all about online marketing, SEO, getting earned media by writing blog posts, guest blogging, creating white papers, attending conferences, networking and so on. Compared with our regular customers, it's quite impersonal. We then wait for enquires to materialize. This is done by the marketing team. Then, the marketing team forwards "good" leads to the sales team. Usually one out of 10 requests is serious enough to pursue. Unfortunately, we don't always know which ones to pursue so we spend more time than we want on inquiries that just do not lead to anything, sometimes not even a response. It is a waste to prepare offers that just disappear. However, one in 20 responds to our standard offer.

Our offers are standard, so they don't really hit the target. It is more a volume business rather than quality. We send the offer as a pdf and also online (link to a webpage). Once the client receives the offer, usually valid for a month, we wait for their response. They can either, print and sign the documents, or they can sign the document digitally via *the web-form. Then we prepare and enter the contract in our internal system and send the invoice. However, it is not until we get payment for the premium, that we see them as clients. Unfortunately, some payments stop after a few months and in such cases, we have to chase them. On a case by case method, we decide either to pursue the matter or just cancel the insurance and send notification."*

Kevin, IT manager, remarked the following:

"Our sales force that targets regular clients use simple paper and Power Point. We have one system where all the contracts are stored, and they use this system (CNTR) to find comparable clients for their preparation. Once the contract is signed, it is stored in this system and the details about what kind of insurance, payment schedule, bank accounts and so on are entered in our system called OPER. We get bank statements (we use several banks) daily. Operations check these against a report that OPER created (report stating what payments are to be received) and someone checks those payments and changes the status to ok. Both CNTR and OPER operate only in our domestic market.

The digital IT structure is different. It is basically all online. They have an online system called INSU that generates, stores and updates insurance contracts. Once a lead comes in, the basic data about the potential client such as name, location, business, size etc. *are entered into INSU (once the sales triggers it) and a contract is generated and sent automatically to the potential client. If the client accepts the contract, it is then exported (manually) and entered into a system called AUIN. This system is the same as OPER built in-house with web interfaces."*

Robert, one of the senior business support staff, explains a bit more about the current state.

"Our operation is quite stable and efficient for the regular clients. It has many manual routines but as the cases are few, it is manageable. The quality is very high, and we seldom get any errors or any consequences of wrong data. However, we are at our capacity. We simply cannot handle more clients without increasing the staff. Our staff is very experienced, and most have been here for years and know the clients well.

For the digital clients, the operation manages larger volumes. The number of cases per employee is 64 for digital as compared to 24 for regular. On the other hand, the error rate is about 8% for digital as compared to 0.5% for regulars. The staff is also less experienced as many are young graduates or students who view their job as temporary. On top of that, we see that the younger generation is more "carefree." They have problems coming to work and when we call them, they say "I am having a bad day." Our regular staff has a deep sense of responsibility and only stays home when they are really ill."

Maria, working in IT, and Sven, working with business support, made the following comments:

"We have IT systems that are designed more to "store" things rather than manage or support a process. That makes the manual steps ever present which more or less limits expansion. This is somewhat true for both regular and digital. In the case of digital, I feel we have quite high expenses related to data error. We had a consultant sit down with us to map the processes of both regular and digital side, but he never finished the work. I will send you the material we have from that work."

Alvin, head of marketing, remarked:

"I just want to say something here. I agree with the comment about systems being more "storage" oriented and that is quite problematic for me. For the regular clients, I can take static reports but not on what I really want. For the digital, I can take reports but not as deep as I want. I need to be able to do some data mining to understand which leads are better, how to approach certain clients, what different industries have in common and so on. I need to get better data for my metrics but now, I have no idea of what "reality" is, as I go on indications."

Rudy, head of finance, agreed and said:

"True, I also want more data than I can get. However, I want to make it clear that we have good profitability but not that much to invest right now. We simply could not invest millions in a new IT project. We have just bought another company and we will need at least 6 months before we make any investment which will be gradual rather than sudden. It would be best if we could start getting some money back from the investment as we progress, rather than at the end of the project in two years."

Tom, chairman of the board, concluded the meeting by saying:

"It's quite obvious that we need to find a way forward. We want to attract and develop a regular client base in the Baltics and get significantly more digital clients in our domestic market. We can enhance one of our existing systems to incorporate the other one, create a new one from scratch, buy a new one or go with a SaaS solution. We need to reduce our operating costs. I am sure there are more benefits we could gain. How have the others solved this? We need to address this. Oliver, can you help us?"

Oliver, senior business analyst, responds:

"Sure, I think I can be of help. Let me give this matter some thought and present a plan."

Exercise 1: Based on the information presented above, prepare a business analysis plan that outlines how you would conduct the analysis work. In this plan, include at least the following aspects:

1. Brief description of the background and the perceived problem.
2. The objective of the analysis work – what is the analyst expected to deliver.
3. The preliminary business need(s).
4. Scope of the change initiative you are to investigate.
5. Main activities you see needed to be performed and main deliverables.
6. Aspects that affect the complexity of the analysis work.

Exercise 2: In the introduction of the case, stakeholders have been introduced. For this exercise, please answer the following:

- Identify the stakeholders.
- Analyze the stakeholders (attitudes, power/influence versus impact).
- Outline a preliminary stakeholder communication plan.

As mentioned before, a consultant had done some work. The results of the consultant in regard to mapping the processes are as follows.

The Traditional Sales

The process for traditional clients begins with sales analyzing and identifying potential new customers. Once they have identified them, they submit a request to the sales administrator.

The sales administrator prepares a report on each of the potential clients. The report covers the information publicly available about the potential client, presents and summarizes experiences and data CusCo has about existing customers that fall within the same customer segment as the potential customers. The report is generated by using their system for contracts (CNTR).

Once the report is sent back to sales, they book a meeting with the potential client. Clients usually agree to have a meeting (with 90% success rate). Following this, sales prepare for the meeting and make a visit to present their offer. At the meeting, sales get a feeling whether there is any interest in their offer.

Out of every ten visits, six are interested, three are not interested, and one says they already have a contract but when it ends, they will contact CusCo. If there is an interest, sales send the data to sales admin. who prepare an offer. The offer is sent back to sales that modify and approve it before sending it to the potential customer. If they already have a contract, the sales admin makes a note of it so that they can be

contacted when their contract is about to end, which when the time is right, is included in the normal flow of interested clients.

Once the offer has been sent to the customer, they wait for a response. The potential customer can accept (50%), decline (35%), or accept with modifications (15%). If they accept with modification, the offer is modified and sent back to the customer for approval until it is accepted.

Once accepted, the contract is sent to the back office where it is recorded in CNTR. The contract is then used to document customer data, payment schedule, bank account numbers, dates and all other data required for the management of the contracts. This data is entered in a separate system called OPER. Once the contract data has been registered in OPER, it is archived.

Back office takes out daily reports of expected payments, extracts a report of payments made to CusCo's bank accounts and reconciles the files to see which customers have paid their premium and who has not. The payment is either ok or something is missing. If it is missing, the matter is investigated, and actions taken to correct it. Back office has to extract reports from the OPER system to find each customer and deal with the problem.

The Digital Sales

The digital process is quite different. The digital marketing team works at getting leads. It can either be earned leads such as writing white reports, case studies, and guest blogs or paid Google ads. As leads come in, an algorithm filters the irrelevant ones (students who register to download white papers and spam emails) and assigns leads to sales. Sales then looks at the data filled in (web form) and selects the best standard offer they have for the potential customer. Once the offer is prepared, it is sent.

Sales then await a response. Potential customers can respond via the email they receive. They can decline, accept, or wish to be contacted. If no response is received after three weeks, the lead is considered dead. This happens in 70% of cases. If the offer is accepted (15% of the cases), the offer and the acceptance of the customer is automatically sent (and entered) to the digital back office. This is all done in a system called INSU.

If they wish to be contacted, a sales rep contacts them. Similar to the process for regular sales, the offer can be accepted or modified and then accepted. If the client wishes to be contacted, it means they are interested but want to have some modifications made to the standard contract. In such cases, as they are in direct contact with sales, we assume that they all accept the offer.

Once in INSU, back office verifies the data by checking the customer data, contract data to ensure that the customer really exists, and contacts them to get their bank details. Once all is correct, the contract is generated and sent to the customer.

Back office then enters the data into AUIN, a system used by the back office for processing contracts. The process of AUIN is the same as OPER (error rate is higher at 15%).

Exercise 3: Based on the above information, map the business model (using the canvas) of both the traditional and the digital parts of the company. Having modeled the canvases, answer the following questions:

1. What are the similarities between the business models?
2. What are the differences between the business models?
3. By comparing and contrasting the business models, what conclusions do you draw in regard to
   - Identifying opportunities for improvements?
   - Challenges that should be considered when moving forward with the project?

Exercise 4: Based on the above information, map the current state from the following aspects:

1. Model the business processes of both the traditional and the digital business.
2. Analyze the IT structure and the IT interfaces.

Exercise 5: What is the main problem to be solved and what are its root causes? Conduct a root cause analysis (fishbone diagram) and an interrelationship diagram. Do you notice any differences to the results by using two different approaches?

Exercise 6: What would the future state look like? Please use the same models as with the current state analysis and consider the constraints or the restrictions that may apply.

Exercise 7: What might be the alternative ways (elaborate on at least 2 alternatives) by which the future state could be realized? How could you assess and compare the alternatives in order to recommend the most suitable one?

21.2 Reducing Disruptions

The European Bank of Commerce (EBC) is a large European bank offering financial services to its customers in 40 different countries. EBC offers a full range of different financial products, such as traditional banking services, life insurances and investment banking. One of the services it offers is trading European equities. Equity trading is one of the most popular services as many customers use it and the volume is very high. Almost all trading is now automated and works according to the principles of Straight Through Processing (STP). Small disruptions and delays

in its processing can be very costly as the market is very liquid i.e. many equities being bought and sold, and prices can fluctuate quite significantly.

All aspects of equity trading such as product development, sales, back-office, processing, accounting, managing regulatory obligations, are managed and run by different departments of the Investment Banking division of EBC. One of the departments, Investment Banking Development, also known as IBD is responsible for product development. This entails introducing new products, workflows, implementing new and changing government and market regulations and other business-related development. IBD is also the owner of all IT systems and, as such, decides on system budgets and the prioritization of projects. IBD also has a team of dedicated business analysts who do feasibility studies, elicit requirements, and sponsor projects and so on. The maintenance and development services are however the responsibility of the IT department of the bank. All projects that require change in one or several IT systems, therefore, include the IT department as well.

During the past year the IT system FLOW has had several disruptions (observed unexpected run-time behavior of the FLOW system, new trades not being processed, users not being able to access certain functions, confirmations not being sent). Such disturbances in the equity trading process are expensive as customers who have submitted orders that have not been executed, are entitled to compensation. Furthermore, it creates ill will and tarnishes the reputation of the bank, causing customers to move to other trading providers.

Initially, the disruptions were considered as isolated instances but as the number of disruptions increased, many worried about the stability of the FLOW system. The bank hired an external analyst to conduct a preliminary analysis. The summary of that analysis is presented below.

The analyst took a closer look at the available statistics regarding the disruptions, and these where gathered and analyzed for the purpose of understanding why there were so many disruptions. The study investigated the impact the disruptions had on the customers and the direct and indirect costs of disruptions. This part of the study verified that there were a lot of costly disruptions and that this was a real, as opposed to a perceived issue that needed to be resolved.

In the next step, all disruptions over the period of one year were analyzed and categorized from different perspectives such as:

- **Customer Impact** – how the customers are impacted, directly, indirectly or not at all.
- **Functionality** – what functionalities of the system, order routing, confirmations, validations etc. were affected or disabled.
- **Location** – refers to which part of the system, ingoing interfaces, within the system, within the outgoing interfaces etc.

This analysis provided a clearer understanding of the problem. There was a pattern of instability in the interface to the main system. This interface has evolved and reached a point where it was not stable enough and therefore, caused disruptions.

However, there were still a large number of disruptions that were not explained by interface instability. The list of disruptions was cleansed from others caused by the interface, which had left 50 disruptions. The number of deployments was also examined. Table 21.1 shows that there was a total of 33 deployments and 50 disruptions within the analyzed year.

The disruptions were then correlated with deployments to see if there is any relation. The correlation between disruptions and deployments was 90% as Fig. 21.1 shows.

Following this lead, a random sample of disruptions was chosen for detailed analysis. This analysis revealed the enhancements were of good quality and the disruptions were not caused by a fault in the code, but the enhancements caused a conflict with each other when deployed. The analysis resulted in a fishbone diagram as depicted in Fig. 21.2.

The FLOW system was originally built to be a limited system performing a few functions. However, over the past 15 years it has been expanding to become much larger and complex in terms of functionality, product coverage, and the number of interfaces and users. The developers (five in total) worked on the enhancements individually without any collaboration from other developers. They designed, coded, tested and deployed on their own. This is captured as "isolated system design" and "singular enhancement testing" the fishbone diagram. As such, the upgrades were deployed without checking if they interacted with other enhancements. The average number of enhancements included in one deployment was five which meant that at least three different developers were involved independently of each other in writing the code. This analysis indicated that the problem was in the software development process. Furthermore, the analysis revealed that the database was very complex and as there was no data object model (complex database in the

Table 21.1 Disruptions and deployments

Month	Deployments	Disruptions	Ratio
January	3	5	1.67
February	9	8	0.89
March	5	5	1.00
April	2	4	2.00
May	2	3	1.50
June	1	2	2.00
July	4	7	1.75
August	1	3	3.00
September	1	3	3.00
October	2	4	2.00
November	1	3	3.00
December	2	3	1.50
Total	33	50	23.31
Annual average disruption ratio			1.94

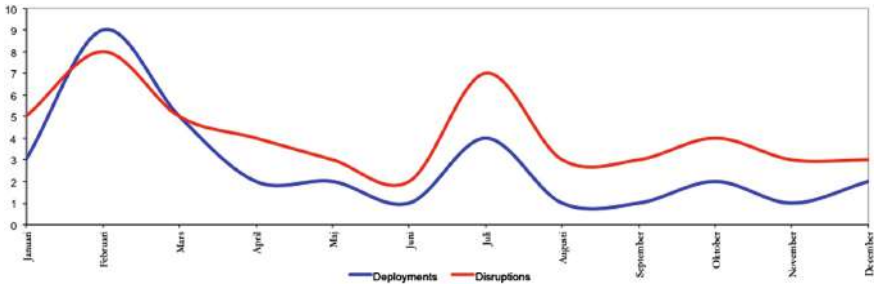

Fig. 21.1 Deployments and disruptions per month

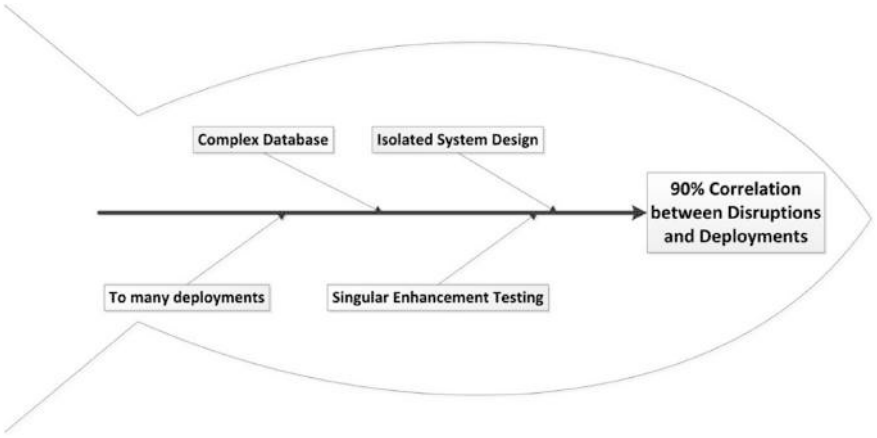

Fig. 21.2 Fishbone diagram of root causes

fishbone diagram), the developers, more often than they should, went on intuition when designing their solutions. Finally, the analysis indicated that there were too many deployments occurring without synchronizing them with each other or with the business side.

The bank has a software development model that resembles the waterfall model but with some adaptations to make it more flexible. The intention is that this model should be used for all software development projects. It was originally designed to accommodate larger projects, but it was also used for small projects. The software development method is a "result based" method. This means that the developers are free to choose how they wish to achieve the results or how they test their code. just as long as the result is achieved. As such, the result is important, not how it is achieved.

The software development process has artifacts, activities, roles, methods, which are described in Table 21.2.

Table 21.2 Elements of the baseline software development process

Element name	Description
Artifacts	
Software enhancement case	Document describing the rationale and the business case for the desired enhancements
Requirement specification	A document containing the requirements of the enhancement that is to be developed
System specification	A document that translates the requirements to a specification of how it is to be developed in the system
Code	The developed code that enables the desired functionalities of the enhancement
Tested code	The developed code after the developer has performed there testing (system test)
Deployable code	The tested code after the user organization has tested and accepted the quality of the enhancement
Deployed code	The deployed code in the live system
Activities	
Requirement elicitation	Elicitation of requirements for the desired enhancement
Requirement specification analysis	The analysis of the requirements made by the developer to understand and figure out how to develop/code the enhancement
Development	The actual development (writing of the code) of the enhancement
System testing	The testing of the developed code of the enhancement
Acceptance testing	The testing performed to ensure that the requirements are met and that the enhancement functions properly
Deployment	The deployment (going live) of the enhancement
Roles	
Developer	The person who develops the enhancement
End user	The person who uses the functionality of the system in their daily work
Business analyst	The person representing the needs of the end users towards the IT organization
Methods	
System specification template	A template for structuring the system specification
Acceptance test template	A template for structuring the acceptance test and entering results (includes requirement, results, comments etc.)
Deployment checklist	A detailed checklist of each step to be taken and checked during deployment

The software development process currently in place begins with a case being made for the desired enhancements. Once the prioritization has been made, the business analyst will start eliciting requirements with the aid of the end user. In this organization, the business analyst is well acquainted with the business and as such, does most of the work. However, the end users verify the results. Once the requirements are elicited and documented, the developer assigned to the

enhancement, will begin producing the system specification which describes in more detail what will be required in the system in order to produce the desired functionality. After the system specification, according to the template is produced, the actual coding begins. When the developer has completed the coding, the analyst carries out tests to check the quality of the code and that the required functionalities are in order. Once the business analyst approves, the developer will deploy the enhancement.

In considering how to solve the issue, there were some factors the analyst had noted. Firstly, the developers were very happy with their working conditions, having flexible start and finish times gave them more independence. Secondly, the bank's central "method division" strongly discouraged the use of alternative methods and wanted to see all divisions working with the standard software development method. Finally, the introduction of a new method takes time to become operational and it should be remembered that these developers were all very experienced and unwilling to change their working routines. As such, the risk of cultural resistance to change was deemed high.

Exercise 1: Given the information above, model the software development process.

Exercise 2: Given the information above, and making reasonable assumptions, detail the fishbone diagram.

Exercise 3: Based on the information above, suggest a set of changes that would reduce the average rate of disruptions to below 1.

Exercise 4: Discuss if the company should introduce the agile method.

21.3 Getting the Groove Back at FunCo Amusement Park

FunCo owns and operates three fairly large amusement parks, in the Baltics, Hungary and the Ukraine. They have been around for a long time and have steadily increased their revenues over the past ten years. They have grown steadily over the past 5 years and have reached their capacity. Joanne, CEO of FunCo has invited her friend Chrissy, a Business Analyst, to meet the management team and discuss the issue.

Carl, responsible for visitors at FunCo says:

"We ask our visitors to share their experiences with us before they leave the park. I don't know if I should be happy or sad. On one hand, they say it is a very nice place and they really like the atmosphere, the kindness of the staff, and the rides. But on the other hand, they have made certain comments and complaints. These are very representative of all the thousands of comments we received last year.

- *It is a lovely place. I like the place a lot. I don't like that I spent hours waiting in line for the rides. Just feels like a pure waste of time.*
- *It is so crowded, my three friends and I got separated and it took us one hour to find each other.*
- *I had to wait 40 min to order my food. That is just too long. My children were hungry, tired and it was a living hell to have lunch. Finally, when we got the food, it took us 15 min before we found a place to sit. Not good at all.*
- *I come from another country, so I had to exchange money. It was a bad rate.*
- *Most of the things I wanted to buy, for example a picture of my daughter when she was on one of the rides, cost €1 but as I come from a different country, I did not have any cash and so I paid with credit card. The exchange rate was very bad especially for a small purchase. It was too expensive, so I did not get many of the things I wanted.*
- *Paying at the restaurants, stores and other things were just too much of a hassle. Well maybe not but it took longer than I had expected it would.*
- *The layout and the map of the park was not easy to understand, several times I wanted to go to a specific area or ride or store but could not find it easily. I could not find any staff to ask either.*
- *I had to wait one hour to buy my entrance ticket and get in. Finally, when I got to the cashier, it was not easy to understand the different packages and it took me time. Seeing the queue behind me, I felt stressed and bought a package that I don't think was the best one for me."*

Emma, the head of marketing, continued:

"We have a good brand name. We spend a lot of money on TV, newspaper ads, billboards, and our webpage is quite informative. People travel from long distances to experience our amusement park. We have been successful because they like us, but if this trend continues, I fear we will lose visitors. Word of mouth will spread, and no amount of good marketing will compensate for that. Also, we want visitors to come back again and again."

Edith, head of operations, continues:

"Our park doesn't have hotels on site, so we need to give the visitors maximum value on the day they are with us. It is sad to hear that the visitors say it's crowded because I see the cameras, some places are just very crowded at certain times, but other areas are empty. If they only knew, they could take the rides or go to restaurants in the less crowded areas."

Jack, responsible for human resources, made the following remarks:

"We can't hire more staff, not only because of costs, but also the situation. Visitors cannot get around as it is crowded, adding more staff will just make it worse. We already have two persons at each ride checking tickets and they are stressed. They are simply exhausted after just a few hours. They are also receiving lots of complaints about the waiting time and that gets them down. They become less friendly which in turn just invites more negative feedback. Five years ago, we used to hire the same people every summer. Now, this year, only 30% were the same as last year. The rest were new which means costs and time for training, supervision and so on."

One of the senior business support staff, Steven, explains a bit more about the current state:

"Most of our visitors who come to us, buy the day package. It's a plastic bracelet that gives them access to all the rides. When the customer comes to the entrance, they stand in line and buy their tickets. There is an entrance fee and then they buy either the bracelet or

single tickets. Naturally we have priced the single tickets in such way to make the day bracelet much more attractive. After they have paid, they enter the park area.

At the cashier, we use a simple computer system that registers the type of ticket (child, adult etc.*) and we also record if an infant is with them or if anyone has any disabilities or medical conditions. This system which we call "VIS", has all the data about how many have come, what ages they are, how much they have paid and so on. It's a fairly simple system with interface to the payment system. Those who have bought only entrance tickets can buy single tickets or a day package at the many booths we have inside the park area. Currently we have about 10 booths. These booths also have the exact same system support as the entrance ticket sales. It is one system that has many terminals, one for each booth. This system is not our own, we have bought it and its fairly advanced, but we only use it to keep track of how many visitors we have and so on. The latest features of this system allow for small trackers and devices to be connected but, as yet, we haven't used them. It definitely feels that we have a BMW, but we use it as if it was a Fiat.*

The restaurants and the stores have another system "FOOD" that can be integrated with "VIS", but we have not done so yet. We have another system "RIDE" that captures data on how many persons use each ride. At the queue for each ride, they show their bracelet, and a sensor counts how many persons have gone on the ride. We don't track who took which ride, we just count the number of persons taking the rides and at what times. We also have an incident report system "SAFE" where we collect all data (reports) of incidents. It can be something the security guards have reported such as drunk and disorderly visitors and thefts (as many come with pockets full of cash, we also have thieves coming to the park). There is another system we have, "OUCH" in which we gather all information and data about the rides in regard to maintenance schedule, inspections, incidents with the rides, and technical issues and so on for all our equipment. Finally, we have our system called "STAFF" that keeps records of all the staff, the work schedules and so on.

When the visitors enter the park, they enjoy the rides, the food, and the other activities and when they feel they have had all the fun they can manage, they leave. As they leave, we have a customer feedback system (several of them at each exit) where they can give us their feedback. This system is called "CUST" and is a web-based system. It's like an ATM machine. The customers can give their feedback if they want. If they do, they get a little souvenir from the park"

Lisa, head of IT, and Lisette, head of business support, made the following comments:

"Ok, yes, we do not have the best IT system support. True. Actually, we have very few systems. Each ride is connected to a central system where we can monitor its performance and so on. Then we have cash registers at each store and booths that sell tickets. So, we could definitely put in better systems. It's going to cost but we should do it. One of my employees, Arne, says that let's just automate everything, so we can get rid of all the staff."

Lina, head of facilities and maintenance, remarked:

"I like the idea of getting rid of the booths (small kiosks placed within the park area where you can buy single tickets or day tickets), they take up space, they are very costly to maintain, and they don't seem to matter so much for the customers. They have to have air conditioning, they have to have electricity and they are so exposed to rain and so on so, no I don't like them."

Victor, head of finance, agreed and said:

"Yes, I agree. They cost a lot and funny thing, very few visitors buy single tickets from these places anyway. Most of our sales, I mean MOST, come from day tickets that allows the visitors to enjoy all rides for a full day. They get a plastic bracelet, which they just show, you know, and then they get to go on all the rides."

Kristina, chairman of the board, concluded the meeting by saying:

"It's quite obvious. We need to find a way to get rid of all the issues that are bothering the customers. We cannot automate everything. I do not want a park where the AI robots have taken over and start attacking the visitors like in a bad horror movie. But we must find a way to manage the situation. Surely, we cannot be the only ones that have had this problem. How have the others solved this? We need to address this. Chrissy, can you help us?"

Chrissy, senior business analyst responds:

"Sure, I think I can be of help. I have taken a course that highlights such problems and will apply what I have learned there. Let me just ask one question, when it's completed, what do you expect to achieve or how do you want it to be?"

Martin, the main investor, says:

"If we can have a solution that will solve the problems of the visitors, that can truly enhance their experience, where they can focus on just enjoying their time here without thinking of delays and hassles, we will boost our sales, increase our visitor numbers and I will willingly put money into such an investment. I want a solid recommendation of a solution within three months. Then we can take a look and evaluate how we continue. As was said before, we just can´t have solutions that require expanding the land area, but otherwise, I am open to ideas. Kai, can you give Chrissy some numbers on our financial situation?"

A week later, Kai (the accountant) sends the following numbers to Chrissy (see Table 21.3):

"Our revenues and costs come mainly from these sources. The costs of goods sold are only on food, games and retail."

"As you can see, our margins are not good enough. We need to reduce our costs, and the biggest ones are salaries and wages. We have seen that, with an increase in visitors, the other costs can remain fairly constant."

The FunCo management team wants a solution that offers visitors to the park a seamless experience with as little hassle and wasted time as possible.

Exercise 1: Identify, analyze (using power/interest) and manage stakeholders. Note that there can be more stakeholders than mentioned above.

Exercise 2: Represent the current state described above with models and motivate why you chose those models.

Exercise 3: Define and explain at least three relevant metrics that can be used to measure if and how well the objectives of the management board are met.

Exercise 4: Search and find information about how digital technologies can be used to solve Fun Co's problems.

Table 21.3 Sources of costs and revenues

Revenues			Costs	
Source	Amount (m)	Average/ person	Source	Amount
Tickets	€14	19	Cost of goods sold	27%
Food	€3.2	3		
Games	€1.3	1.4	Salaries/wages including taxes	€6.4 m
Retail	€0.9	0.6	Marketing	€1.2 m
Parking	€0.4	0.48	Repairs and maintenance	€1.6 m
Sponsorship	€0.3	0.21	Other costs	€2.5 m
Other	€0.2	0.15		
Total	€20.3	24.84	Total (excluding COGS)	€11.7 m

21.4 Digitalizing Development Booklet at ConsultCo

ConsultCo is a European software development company whose mission is to be among top five in its market. One of the main strategies to achieve this objective is to offer their employees the best professional development available. The idea is that if the staff is constantly at the front line of learning and competencies, the company will maintain a lead in the market. The concept is that ConsultCo works with an "incubator and accelerator" of staff competence. To this end, the professional development processes are very important to the company.

When they start at the company, every employee receives a manual of the company's guidelines called "the booklet." There are quite a number of problems with this booklet. Firstly, it is physical, so it gets lost, it's difficult to aggregate data, keep updated, and for managers to track and monitor progress. As such, the head of HR decided to replace this material booklet with a digital one.

ConsultCo consists of several business areas. The company has six business areas in addition to traditional functions such as marketing, HR, internal support and so on. The business area is concerned with building solutions for customers, such as, insurance, telecom, health care, mobile apps, online solutions, and the supply chain. Each business area is divided into delivery teams. There are about 50 delivery teams in the whole company, each belonging to one business area. Each business area has a manager who reports to the CEO. The delivery teams have a team manager who reports to the business area manager. Each team consists of 15–25 employees with different roles such as lead developer, software developers, user experience specialists, architects, quality assurance, deployment specialists, and analysts.

The recruitment process is important to ConsultCo. Ensuring that the right people are hired is the foundation for further competence development. When a candidate applies for a position, he or she is assessed regarding their competencies. The candidate will have an interview with HR, the team manager, a specialist

within the same field, and may even work with the team for a day. If the candidate is applying for a development job, which is the most common application, he or she is also given a task to develop code. If the candidate is suitable and passes all the tests and interviews, he or she is hired. On his or her first day, he or she meets the head of HR. who introduces him or her to the philosophy and professional development policies of ConsultCo and he or she receives his or her personal booklet.

ConsultCo has an internal library with more than 500 books related to their field. In addition, they have subscriptions to digital libraries as well. Twice a year, they hold "hacking" training day. These events are to encourage the specialist to be more creative in his or her thinking as well as learning new technologies, methodologies, and tools. All junior specialists hired by ConsultCo, with less than 2 years' experience in their current role, have a personal mentor at the company.

The team manager has two development consultations with every specialist. One is for professional development and the other is for technical development discussions. The HR makes sure that these consultations take place and reminds managers should they forget.

The team manager schedules the meetings and conducts them. For each meeting, a specialist is also present. The team manager does not always have the competence to discuss the matters in detail. As such, for technical development discussions, a competence leader participates. This person is highly experienced in their competence and operates across all business units. The team manager sends a report to HR after having concluded the meetings in which the action plan of the employee is outlined as well as the general assessment of the employee.

ConsultCo has a professional development roadmap. The booklet is a part of this roadmap and contains the development plans. The contents of the development plan are "Assessment Now" (describing where the employee is at this stage), "Next Step" (where the employee wants to go), "Reading list" (what the employee should read), and "Trainings" (what further training is required by the employee). Each role has a progression of steps in regard to paths employees can choose. An employee can take the following path. Junior developer – developer – senior developer – specialist – expert. A similar five step structure exists for almost all positions at the company. To complete all the steps would require about 10 years.

The HR is not particularly happy with this situation and has identified a few issues with the structure of the current booklet. Constant re-working and updating of a physical booklet can be costly and troublesome, especially when an employee loses his or her booklet, which happens quite frequently If an employer loses the booklet, the HR has to find the reports sent by the team manager, the manger has to then take a look at the plan, spend time on tracking back, checking what the employee has completed or not. It is a waste of time. Team managers have started complaining that the number of meetings and the time they are spending on meetings is getting a bit out of hand.

Team managers are also complaining about constantly having to update the booklet. The initial idea of the booklet was good and worked well, however, with

all the changes required and the large increase in staff numbers to over 1000 employees the booklet is no longer a viable item.

HR is not really happy with the fact that transparency is non-existent. They cannot see the updated info in the booklets. In order to get a yearly overview, they have to examine hundreds of booklets or reports from team managers, and as no one from HR reads these reports the question should be asked, why are the reports being sent. At the moment HR cannot work with an aggregated development of competencies. The head of HR commented that she does not have an overview of what ConsultCo has in regard to the capabilities and competencies in Java development.

In its present form, the booklet puts constraints on time. The employee might have written that he or she is reading a book or training on a certain topic. However, there is no information about what books or what trainings. So, the employer spends a lot of time trying to find a good book or find appropriate trainings. In the end, the employer might select a training that is not good. The problem is that there might be 15 other employers looking for the same training. They might take it as well without knowing that it was a bad one. HR does not like that they have 15 different registrations, all paying full price for the training when they could get a group discount.

An analyst working with the HR mentioned that they are seeking a solution that covers the following main areas of functionality:

- Digital booklet
- Tracking of employee progress
- Central user right management and administration
- Ability to have aggregated business data analytics

ConsultCo is not ready to adopt these changes and does not want to abandon their philosophy regarding the professional development of their employees. It has been successful in the past and they believe in it. However, the supporting solutions are not up to date. ConsultCo are willing to invest in a new solution but it is important that the solution does not require a lot of maintenance and development resources. ConsultCo would prefer to use their developers for revenue generating projects rather than internal ones. The time frame is also fairly short. The new solution needs to be up and running within a year. Not all functionalities should be ready but enough to roll out the new solution.

During a meeting, a few ideas had been presented. Finding a ready product from a vendor was considered as an option. Such a solution would then perhaps need to be customized and adapted to the ConsultCo context. Perhaps a SaaS solution would be suitable. Could the system be built in-house or should it be contracted to another firm? However, it became clear that there was not enough information to take a decision. The management felt they needed to know more about the alternatives, if the professional development process should be modified, and how much such an investment would cost.

Exercise 1: Assume the management team is unwilling to decide whether to go forward or not. They want to know more about the alternatives, what would be the best solution, and how much it would cost. In other words, the management board wants to know what path to take. As they are impatient, they give you, the business analyst, six weeks to investigate this matter. Based on the information above, outline your business analysis plan considering the objective, needs, scope, stakeholders, activities, complexity and risk.

Exercise 2: Assume the management board decides to go forward with the project. Conduct a thorough problem analysis.

Exercise 3: What kind of alternative solutions can you identify (change strategy)? You are encouraged to search for information from other sources.

Exercise 4: Based on the text and seeking information from the internet, write a set of user stories.

Exercise 5: Based on the text and seeking information from the internet, develop some prototypes, wireframes, and some designs of how the user interfaces would look.

Exercise 6: Discuss if you propose a predictive or adaptive approach when delivering the solution.

Exercise 7: How would you measure whether the solution achieved its goals or not, if it gave the effects or not (develop and define metrics you would use to evaluate the solution)?

21.5 Online Confirmations

A large bank does many foreign exchange trades with large corporations, institutions, private persons but also with small and medium sized companies. Their trading with other institutions and large companies is fully automated and digitalized. Such trades require immediate confirmation as they incur currency risks. For their existing online solutions, the bank offers a highly streamlined and automated trading processing. The confirmation process is also highly automated for this type of customer. Essentially, a trade is made either over the phone, chat, or online portal. Once it is entered in the system, confirmations are sent and matched using a variety of different systems. However, only larger companies and other banking institutions can afford such matching systems. It is not necessary for small and medium sized companies to invest in such software as they only trade in small volumes.

The problem is the small and mediums sized enterprises (SME) use the online portal but the back office is not automated. As such, confirmations are produced and sent by ordinary post to the SMEs. The SMEs have to sign the contract and return a copy. This is highly problematic due to the following reasons.

- Internal revision has noted that more than 560 trades are unconfirmed, meaning that the counterpart of the trade has not been signed and returned the confirmation.
- The branch offices are responsible for the clients and as such, they have to remind the customers. They find this to be time consuming and non-value adding.
- Several customers have complained that the paper work is too cumbersome and are considering moving their business to competitors who do not require such stringent rules to be complied with.
- All the confirmations that are sent out by ordinary post are costly.

As such, the management team has asked a business analyst to investigate the matter and find a solution that resolves the current problems. The study is to cover the following aspects:

1. Map the current situation to get a better understanding of where the problems are.
2. Find alternative solutions that are acceptable for the legal department, the internal revision, and with the customers.
3. Present a rough estimate of time and cost for each alternative.
4. Recommend the best alternative with motivation.

The study is to be presented to the management team within three months. There are no dependencies identified at the time being.

Exercise 1: Based on the above background, present a plan of how you would conduct the analysis work in order to deliver the above listed results. Include activities, tools, and methods in your plan.

The management team had asked another analyst to conduct a study several years ago. Below is a summary of what the analyst reported.

When a customer makes a trade via the online portal, the trade is automatically directed to the front office system called FRONT. Then it is automatically transferred to the back-office system called END. As these trades are standard the back-office system simply processes them and produces a confirmation. The confirmations are sent to the general system used by the bank that sends out paper post called POST. This system is shared by the whole bank so everything that goes out by post is sent through this system. The confirmations are sent out by the POST system with a night batch, and then the system processes all the documents (printing, sorting, and putting them into envelopes) during the night. By morning, all is ready for pick up by the post office. The customers receive the confirmations about 2–3 business days later. The customer then signs the contract and sends it back. This might take anything from about a week to several months. When the bank receives the signed confirmations, they sort it, and mark it as signed in the back-office system. The trade is then complete. However, as not all customers sign and return within the required two-week period, the back office takes out daily reports from the END system. This report shows all the unsigned contracts per

customer and who the responsible branch office is. Then the back office sends the report to the branch office as a reminder. The branch office has to chase the confirmation signatures and have the customers send it back to the main office. The customer's signed confirmation is sent by post, to the back-office and is checked off in the END system; because of this delay it takes time before these confirmations come up on the daily list. Back office gets the list and reminds the customers, who spend time finding the confirmation, only to find that they have already signed it. This naturally causes some confusion, embarrassment and annoyance.

An option that has been looked at is to use the e-archive of the bank (see Fig. 21.3). All papers sent to the POST system, are also sent digitally to the e-archive. The idea would be to add a functionality to the online portal called "confirmations." This part of the online portal is connected to the e-archive, so they can retrieve it. It is in pdf format, so the customer cannot change or amend anything. The customers, having logged into the online portal, can view their confirmations and electronically sign the confirmations. Then the confirmation signature would be sent to the END system and the status of the trade changed to "confirmed." However, there is a need to enhance access rights in the online portal as those who make the trade, are not allowed to sign the confirmations.

Exercise 2: Map the current state by modeling the business processes and the IT structure.

Exercise 3: Revise your plan of activities—do you need to add anything else and/or are there activities that are no longer relevant to conduct?

In the documents analyzed, there was a rough listing of requirements for the solution in Fig. 21.3. These were as follows:

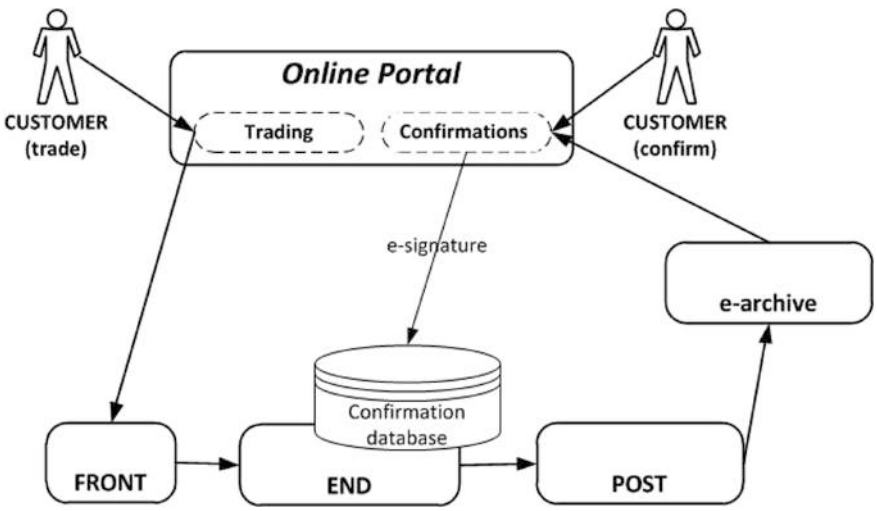

Fig. 21.3 Solution draft using the e-archive

Online Portal

- Enable users to access the new function of "confirmations" in the online portal.
- Develop new dialogs for the online portal so customers can view, search, and sign confirmations.
- Connect the online portal to the banks e-signature solution.
- Same dialogs are to be visible to the back-office staff, so they can work with and see what the customers see. This is required for support reasons, but the access rights must be different.
- Ensure that customers cannot sign contracts without having opened them.
- Ensure that only authorized persons from the customer's company can sign confirmations.
- The most important data of the confirmations is to be shown, one per row, to the customers.

END system

- Modifications to the existing database for confirmations to check who signed the confirmation, when it was signed, and verification of the signature.
- A new functionality to search for electronically signed confirmations.
- Modify the report of unsigned confirmations, and the possibility to customize these reports to search for different parameters.

POST system

- Exclude all confirmations marked for e-signature when printing, sorting, and enveloping confirmations.

E-archive system

- Interface from the online portal where customers can access the confirmations.
- The confirmations must be presented in a format that does not allow the customer to make any changes.
- Indexing of key data so the customers can search and find specific confirmations. The indexing must include the following data.
  - Type of currency trade
  - Type of confirmation (new, cancellation, amended)
  - Counterpart (customer name)
  - Reference number
  - Trade date
  - Settlement date
  - Buy currency (the bank buys)
  - Amount bought
  - Exchange rate
  - Sell currency (the bank sells)
  - Amount sold
  - Status (pending, signed)

Table 21.4 Statistics on confirmations for year xx

Confirmations	Jan	Feb	Mar	Apr	May	Jun	Total	%
Post	17,876	18,999	15,673	14,566	15,443	13,563	96,120	64
Matching	6775	7667	6554	7669	6443	6113	41,221	28
Linked settlement	2136	1984	2044	2176	2199	1901	12,440	8
Total	26,787	28,650	24,271	24,411	24,085	21,577	149,781	100

Exercise 4: Create a customer journey map to capture the customer's point of view. Do you see any problems with the solution (a hint is to consider time)?
Exercise 5: What are your thoughts about the solution? Will it work? Please motivate your reasoning and conclusions. Can you think of alternative solutions that would be better suited? Why do you think each of your proposed alternatives would be best?

The analysis report also included some statistics about the number of trade confirmations. These are mainly by post, by matching (using a third party) or via common platforms used by banks. These are presented in Table 21.4.

Exercise 6: What metrics would you find relevant to use to evaluate the solution (a hint is to not only consider the above table but also the problems initially stated)?

21.6 RetailCo Going Digital

RetailCo began in France with one store selling mobile phones and related products. They bought used mobile phones, repaired, upgraded and made them look like new. The refurbished phones were sold in countries where such items were expensive to purchase when new. They began their business with mobile phones but today work with TVs, laptops, computers, notepads, iPads, washing machines, and any other electronics they can fix and sell.

RetailCo began their business with one store in Paris, France. They have successfully expanded their stores to all major cities in France. Although they are doing quite well, they are concerned about the recent digitalization trends in the market and feel that they need to adapt. To be in line with the technological developments, they want to use the emerging possibilities to their advantage.

RetailCo realize that they will need to make changes to their current business model but not necessarily completely replace it. Rather they see their present stores as a point of strength. The CEO of the company is very interested in knowing what digitalization could do for them and wants to investigate it further. To take such a decision, they need more information as to what aspects of the business can be improved or changed with the help of digital technologies, whether it would be valuable or not, and how much it would cost.

RetailCo has hired a business analyst to help with this. The analyst had a chance to meet some of the other people that would potentially be involved in the project. One of them was Mary, the CIO. Mary said that they used an ERP system which had been acquired from a bankrupt startup company many years ago. The system administrator and the main developer expressed doubts that the system would be able to cope with additional requirements in its present condition. It is too "heavy" and difficult to work with. They both expressed the opinion that the old system needed replacing. Carl, the head of stores, noted that some of the store managers should be involved in the work as they have valuable "front-line" information and experience. As the ERP is quite old and difficult to work with, many of the staff have found ways to work around the system. Janette is someone who should be involved. She is the head of logistics and along with her key team members Dan and Lisa, works very closely with the logistics issues and all are subject matter experts.

Exercise 1: Develop your initial business analysis plan considering mainly the objective, the activities required to meet the objectives, aspects that could make the analysis work, and stakeholder engagement plan (identification, analysis, communication plan).

During the analysis work, John, the process owner, explained that they mainly sell their products overseas. Asia, Latin America, and Africa are very big markets for them. RetailCo also sells their goods in their own stores. The profit margin on the products is low so shipping is an issue. John explained that the shipping costs need to be as low as possible and currently, they don't have a good solution. Costs on outbound logistics, are challenging and inbound is not free of problems. Many parts are needed to repair the items, but not all items are needed as much as others, so, stocking a large inventory of parts is perhaps not the best strategy.

Anna, head of marketing, continued explaining that the main customers are actually not the end users. It is the retail sellers in the Asian, African, and Latin American markets. Today, we basically rely on our historical data and gut feeling when deciding what items to send to where. We know that a certain phone is more popular in India, so we send it there as the probability of selling it there is higher. Perhaps we can do something here to make this more efficient? It would be good if we could target the end customer as well. We would see better product margins if we do so. Today we get about 40% of the final selling price.

Exercise 2: Given the information above, define the problems, business needs and list a set of high-level business requirements.

The current IT structure is fairly simple. Each store has its own system called BOS which is connected to ERP. All sales are registered in BOS and the data is transferred to ERP every night. We only have seven stores, so the interface between BOS and SAP is one-way. ERP has all the data about inventory, products and so on as it gets it from BOS. However, BOS does not hold that information, nor can it get it. If we want to know if another store has an item, we have to call the main office and they will look into ERP and tell us. The main office also has another system for accounting and sales called SAL. ERP and SAL do not have a good interface. We

have three persons taking reports from ERP and entering the required data in SAL. SAL is the main source for accounting and making projections but as it is inefficient, it is only used for simple accounting. This is a limitation today. There is an online portal called ONLI, but it is very basic. Although it is bad, every week we still get a few orders from it. These are processed manually. However, as we don't have access to the inventory, we just have to tell the customer that the product is out of stock. On ONLI, we only put our most common items, those that we know we have in stock.

Exercise 3: Given the data above, model the current state IT structure.

Exercise 4: What alternative solutions can you identify given the information above (and perhaps with making reasonable assumptions)?

Exercise 5: How could you evaluate if the solution is successful after it has been deployed (a hint is to think of metrics and the actual business needs)?

Exercise 6: Would you recommend a predictive or adaptive approach? Please motivate your recommendation and discuss the risks as well.

21.7 In-House or SaaS

Background

NFI (Nordic Financial Institution) operates mainly in the northern European markets. NFI provides financial consulting for clients with a net worth of more than 1 million €. They have distinguished themselves from their competitors by providing quality analysis, individualized and active portfolio management and personalized advice, and by offering a wide range of financial products for trading. They can trade financial products ranging from simple foreign exchange to commodity derivatives.

During the past ten years, NFI has built up its business using a variety of different system solutions. However, with the increase in volumes, they need a presence in several countries. The market is developing fast and the current software infrastructure is not keeping up in terms of costs (maintenance) and functionality. In addition, there are many governmental regulations that require some adaptation or enhancements in the IT systems.

The cost of an IT system is significant (see Table 21.6) and the maintenance relatively high in relation to development. Also, the demanded functionality is not being delivered fast enough (long time to market). So far, they have provided services to markets close to home. However, market changes are forcing them to have a presence in major financial cities around the world such as New York, London and Singapore. Therefore, it has become clear to the management team that a new front to end system solution is required.

A feasibility study was conducted which concluded that several vendors offer full system support for all products currently being traded by the major financial institutions. One of the vendors offers two alternatives. The first alternative is to buy the system and implement it in-house and the second alternative is to run it as SaaS. The vendor has had their main system for quite a while but has recently introduced their software solution as a SaaS. This is an interesting option for NFI to investigate.

Considering that this is new territory for NFI, they have hired you to help them. You have conducted a series of interviews and below is a summary of your findings.

Competitors

The main competitors to NFI are other similar actors in the market, but they do not offer the quality of analysis that NFI does. As such, the clients of the competitors have an average net worth that is significantly lower. The traditional banks, offering private investing, are also competitors. The banks compete more predominantly by offering a wide range of financial products as they can take advantage of their large infrastructure and connections to various markets.

All competitors have in-house solutions as a system support for their business. SaaS is relatively new in this market and no one has adopted such a system solution. It will be very difficult for traditional banks to take such a leap, but smaller competitors might very well move towards such solutions. If they do, and NFI remains with in-house based solutions, it could lead to a loss of competitive advantage, narrower margins, lower profitability and in the long run, difficulties in attracting high-end analysts.

On the other hand, having a software solution that is cutting edge will allow NFI to take advantage of developments made in their system and thus, being able to quickly use them. If several clients request added functionality for a certain product, the vendor will be more likely to develop that functionality. With a SaaS solution, that functionality would also be available to NFI. However, the question was raised as to how specific customization and product innovation initiated by NFI could be retained by them. If NFI introduces a new product or functionality that others lack, will all other users of the SaaS solution, gain access to that functionality as well? Should that functionality be developed outside of SaaS in an in-house setting or would it be integrated with the SaaS solution?

Vendor

The vendor, Rumbline, has been around for about 10 years. They started as a small firm developing a trading system but as they gained more clients, they extended

their software to include front to end support for all financial products. Their latest development is to offer their product as SaaS and in doing so, they have created a separate company named Mimline, which is fully owned by Rumbline. Mimline only uses SaaS as their trading platform. They will have their own development team to manage minor issues, bugs, set ups and so on. However, the main development takes place within Rumbline.

Currently, Mimline has only a few clients, all of which use the SaaS for limited products in low volumes. NFI would be the first client to use the system for all products and with medium volume. As such, Mimline would be using NFI as their pilot client and would give them preferential treatment. However, if Mimline signs more clients, will that affect the attention they give to NFI when support is needed to solve any IT problems? How will the bugs and issues of NFI be prioritized?

A senior manager of NFI, raised the issue of what would happen if the vendor discontinued or downsized its services due to either poor profitability or bankruptcy. Similar questions were raised as to what would happen if Mimline failed to get enough customers and how that would affect their ability to attract and maintain competent and skilled IT staff.

Data Management

The core business of NFI is providing high quality analysis and trading various financial products. Managing IT systems and structures is not part of the core business of NFI, but it is very difficult to separate IT from trading financial products. The global financial markets are operating with IT and as such, one cannot survive without the other. The trading managers are increasingly becoming involved in IT and its strategic conversations. In fact, most of the market leaders continue to maintain their competitive advantage by exploiting the use of their IT systems. They have implemented an infrastructure that is relatively cheaper to maintain, provides the required functionality and is adaptable and extendable to accommodate changing requirement.

Another aspect of having in-house software solutions has been data confidentiality. Considering that the business of NFI and all other similar actors is data (on clients, trades, worth, risks etc.), control of data and it being kept safe and confidential, is very important. In fact, many competitors argue data integrity motivates higher IT costs. Some of the questions raised were; - what would happen if NFI data were compromised? - is it possible to have sufficient security of sensitive data with a SaaS solution? - how safe is the data of NFI with a SaaS solution? Furthermore, some questions were raised as to how secure the connection between the trader and the system would be with SaaS solutions.

Stability

A few years ago, NFI hired a consultancy firm to suggest how they could improve the stability of their infrastructure. This study was initiated as NFI had experienced several disruptions in terms of systems being down, confirmations not being sent out, connections to market places not working properly and therefore trade orders were not being sent to the markets. Such disruptions are costly and inconvenient.

The analysis showed that most of the systems have an impressive up-time but since they are interconnected, one disruption at a critical place in the infrastructure can cause a domino effect. So, while all the systems, when looked at individually, had a good up-time, the infrastructure as a whole did not have an acceptable up-time (see Table 21.5). The analysis concluded that measures taken would have had, compared to their cost, a low impact. It was also noted that the IT team were quick to respond to disruptions and their high competency and familiarity with the systems, was key to quickly resolving the disruptions. However, the issues with stability are still to be resolved at NFI. The same analysis concluded that had the system infrastructure been consolidated, i.e. software, regardless of in-house or SaaS, disruptions would have been reduced by 40%.

One of the managers commented that with the one system solution there would be less disruptions, but with NFI controlling the in-house solutions it would control disruptions and prioritize how to resolve them. This raised a concern from another manager about the extent of control NFI would have in prioritizing and influencing how disruptions would be resolved.

In addition, the risk manager raised the issue of how much control and insight NFI would have in how Mimline manages, oversees, reduces, and improves their processes in order to gain efficiency but more importantly, keep their operational risk at a minimal level. With in-house solutions, NFI will have full access to such issues and it is within the power of NFI to prioritize which operational risks to reduce. How could this issue be affected by a SaaS solution?

Profitability

NFI, as mentioned before, needs to have a presence in other financial centers such as London, New York and Singapore. That would require local installations of

Table 21.5 Disruptions

Root cause	Number	Average cost	Total
Internal interfaces	5	4000	20,000
Enhancement bugs	25	1500	37,500
Performance issues	4	15,000	60,000
Markets (external)	3	2000	6000
Total	37	22,500	123,500

software systems or hosting from the in-house installation at their headquarters. In either case, some resources will need to be installed in the local markets in order to support the business. The IT manager noted that with a SaaS solution, the time it will take to get to full operational capacity in all these cities, will be significantly reduced. In fact, with SaaS, only a laptop and Internet connection is needed. A previous study had shown that setting up an office in London, New York or Singapore would cost €100,000 for each site, however with an in-house solution, it would only require €30,000 per site. This investment will take place in year 2, 3 and 4 (one year for each site).

NFI would like to provide their customers with their own portal for trading. Some clients wish to be more actively involved in the trading activity and therefore, the idea is to allow them to have their own trading portal where they can follow the markets and enter orders. Such a solution would be too expensive to implement with an in-house solution, as it would require building this functionality from scratch. With an in-house strategy, this line of action will not be pursued. However, with a SaaS solution, this would be possible. As an extension of this idea, it would be possible to serve clients residing in countries outside of NFI's main market. NFI had the idea to move towards digital solutions by providing the same services over video conferencing techniques. To attract clients, such a move would require 2 years to set up and during this time profits would be eaten up by costs (such as marketing). From year 3, it is estimated that an annual profit of €100,000 would be generated.

If an in-house solution is chosen, as NFI will have a fully operative front to end system, they will be able to sell their services to other minor players (that are not direct competitors) who would outsource part of their processing to NFI. Such a service would yield €500,000 per year from year two.

The current IT structure needs to change if NFI is to stay competitive. However, an in-house solution would cost less than a SaaS solution. The gain in this respect should be significant as all the mandatory enhancements NFI has to fulfill, in order to comply with new governmental regulations, would be taken care of by both in-house and SaaS solution. The enhancements required for complying to governmental regulations costs, on average, € 40,000 per year, is not included in the budget.

There would also be costs savings in terms of maintenance, hardware and enhancements. It has been estimated that with a consolidated system solution, the IT costs of NFI would be reduced by 60%; this excludes the costs for development which will remain the same.

Every market place that NFI is connected with (through interface) requires development and testing. As this cost occurs for each market place, NFI have to choose carefully which ones to invest in. These costs are included in the development budget of each system. However, with SaaS, all these interfaces would come as default and be managed by the vendor.

One of the managers was concerned that NFI have no prior experience of SaaS and that NFI were unaware of any other competitors who had made a move from in-house to the SaaS solution. As such, NFI does not know what other benefits or advantages SaaS has over in-house solution and therefore would like to know more about how SaaS can bring value to NFI.

Exercise 1: Prepare a business analysis plan and map it to include what has already been done. Find anything else that needs to be added?

Exercise 2: Based on the information you have, produce, with any further observations, the following tasks:

1. A list of the advantages and disadvantages of in-house and SaaS that are best suited to NFI.
2. A description and prioritization of the risks of the in-house solution as compared to the SaaS solution. In addition, each risk should be assessed as low, medium, or high.
3. A list of how an in-house solution and a SaaS solution would bring value to NFI (higher revenues and lower costs).
4. Your recommendation and motivation (considering the concerns raised by the management team and additional issues you have identified).

Exercise 3: You now have to take a closer look at these alternatives, consider the benefits and the risks, and based on your qualitative analysis, evaluate the two alternatives from a financial point of view (business case analysis over 5 years) and provide your recommendations to the management team. For this exercise, you have additional financial data as presented in Tables 21.6, 21.7 and 21.8.

The cost of an internal IT resource is 48,000.

The implementation of an in-house solution would take two years to complete and from year two, it will be fully functional and operational. The licenses (perpetual) would be paid at the end of year one. All other costs except training will be evenly distributed over the first two years. The training costs will be at end of year one. The implementation would require stopping all development of IT systems at NFI and require 4 full time IT staff per year and external consultants costing € 30,000 per year. The set-up charges, including acceptance testing and training of NFI resources has been estimated at an additional € 50,000 in the first year.

With a SaaS solution, the implementation time would be much faster. NFI would be fully operational for full-scale trading in year one. Furthermore, the sites in London, New York and Singapore would cost only € 5000 per site. NFI would still keep two IT personnel for front end support, contact with vendor, and managing new set ups. As the system will not be installed at NFI, there is no need for space, hardware and related costs. This means that the internal IT costs (non-IT resources) would be zero. Development would remain the same but external consultants would

Table 21.6 IT costs of NFI

System	Products	Description	Internal IT costs	External IT costs	Development costs	IT staff
SFD	Standardized derivatives	Manages all kinds of standardized derivatives and has interface to markets. This is an off-the-shelf product with perpetual license, but upgrades are needed every 3 years. Next upgrade is in Year 1	150,000	30,000	40,000	2,0
CFD	Customized derivatives	For all other derivatives it was built by NFI	10,000		5000	0,5
ETS	Equity trading	Off-the-shelf system for equity trading that will require renewal of license every 7 years. The next payment will be in Year 4	100,000	250,000	25,000	2,0
FIT	Fixed income trading	Off-the-shelf system with perpetual license requiring no major upgrades	40,000		10,000	1,0
FXMM	FX and MM	Off-the-shelf system with perpetual license requiring no major upgrades	30,000		10,000	1,0
	Administration					1,5
	External consultants			100,000		
		Total cost of IT systems	330,000	380,000	90,000	8
		Total cost of IT	1,184,000			

Table 21.7 Vendor cost for in-house solution

Cost of in-house solution	Cost
Derivatives module	70,000
Commodity module	50,000
FX and MM module	40,000
Equity module	20,000
Fixed income module	20,000
Gaps (enhancement)	50,000
Implementation	200,000
Set Up and data migration	100,000
Training	50,000
Other expenses (travel etc.)	40,000
Total	640,000

Table 21.8 License costs for SaaS solution

SaaS Vendor costs	Cost
Derivatives module	250,000
Commodity module	150,000
FX and MM module	140,000
Equity module	60,000
Fixed income module	70,000
Gaps (enhancement)	50,000
Implementation	100,000
Set up and data migration	100,000
Training	50,000
Other expenses (travel etc.)	20,000
Total	990,000

no longer be required. As there is no implementation needed with the SaaS solution, the project costs for NFI would be lower as compared to the in-house solution. Only three IT staff are needed for implementation, no external consultants are needed but the internal resources requirement would be euros 130,000.

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