



Collection of expert examples on change in IT projects

Arlette Keller

Haaga-Helia University of Applied Sciences
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Abstract

Author(s) Arlette Keller
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<p>The aim of this thesis is to collect real-life examples on change by interviewing senior project managers. The interview questions are based on the Project Institute's latest guide, which was published in the year 2021. In this guide, project performance domains are described. Together, the eight performance domains function as an integrated system that will help project managers to successfully deliver a project.</p> <p>This research-based thesis uses the method of qualitative interviews. For the interviews, four project managers were asked to elaborate in detail stories and opinions on the different performance domains. The result of the work includes a summary of the different interviews taken in the month of August 2022 as well as an analysis.</p> <p>The thesis is structured in three parts. The first part is the theoretical framework, where the most important definitions are explained. These definitions serve as the foundation for the second part, which is the elaboration of the project performance domains. As there are too many changes, the scope for the interview had to be reduced to a certain number, therefore the eight performance domains were chosen. Exploring the domains in detail helps the researcher and the interviewees to be on the same page. The third section covers the empirical part. There the interviewing method is explained and the interviews are summarized and analyzed.</p> <p>The conclusion shows that there are some similarities between the stories from the project managers, especially when it comes to choosing the development approach, where all interviewees favored the agile approach. This result helps new project managers to better navigate the project and avoid mistakes, as they can learn from the examples and opinions of the senior project managers. This will help companies to save money and time by reducing the problems in IT projects.</p>
Keywords Business IT, Project Management, change, PMI, performance domain, interview

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1 Introduction

Project managers state that 90% of their job is managing and communicating changes when working on large projects. Another survey shows that 70% of project managers say that managing changes to requirements takes at least 10% of their time, while 30% of the respondents say that it even takes one quarter of their time (Schwalbe, 2009). These numbers show that the development of processes around the subject of changes in IT projects is important.

According to the Edelman Trust Barometer 2020 there were 61% of the participants who agreed that the pace of change in technology is too fast. But even despite this increased speed of change, 44% stated that their employer successfully used technology to improve customer service and 45% that using technologies made processes more efficient and reducing the overall time needed (Edelman, 2020).

One explanation of the advancement of technology is the phenomenon called 'Accelerating Change'. Meaning that every improvement done in technology will help creating better and faster technology, which in turn will again work as the foundation for faster progress in technology. Every generation of technology is better than its predecessor (Mortenson, 2021).

Technology will continue to grow at an accelerated pace. But this progress does come with a price, as it touches and changes many different fields, including Project Management. As the pace increases, the Project Managers need to adapt to this new rhythm or they could find themselves falling behind and be replaced (Coleman, 2019).

Not only do project managers need to get faster on adapting to changes, but they are also expected to deliver the products or services at the same rate as the technological advancement. For example, software development projects can be outdated by the time they are deployed and ready to use (Volanen, 2020). One data analysis company even goes as far as to say that trying to predict the future is useless, as the pace of change has become so fast (Jordanov, 2021).

As soon as projects involve new technologies, the degree of uncertainty increases. And as the uncertainty increases it becomes harder to meet a project's scope, time, and cost goals. Developing coping skills on change becomes crucial for project managers, as they need to lead and handle changes within the project or the organization (Schwalbe, 2009).

Gartner, the research, and consulting company analysed that 53% of the surveyed companies' readiness for digital transformation is not known and that there is no testing has been done regarding digital challenges (Business, 2020).

Despite the occurrence of unexpected changes, the focus on potential positive outcomes should not be neglected by project teams, as changes can even favour new opportunities and better outcomes than originally planned. Outcome, or generating more value, should be targeted by decision makers, instead of the deliverables (Project Management Institute, 1996).

These are some of the sources that show the importance of skilfully adapting to changes. However, due to the fast-paced nature of the development of technology, how to adapt to these changes has been less studied. In light of this, this thesis will collect real-life examples of experienced project managers working in the IT field on the different performance domains provided by the Project Management Institute.

1.1 Objectives

The objective of this thesis is to collect various examples on change in IT projects, which is also the title of this thesis. This will be accomplished by researching and studying existing tools, methods, and practices, as well as trends in IT project management to create the theoretical part and the baseline for the interviews. The aim is to find a thorough set of changes in IT projects with examples, where projects succeeded and/or failed. This will help Project Manager to manage changes more efficiently, by learning from past experiences. The result of this research study includes various examples based on the different performance domains provided by the Project Management Institute.

The purpose of the thesis is to help Project Manager to work more efficiently and to keep up with the changing trends, so that in the end the project will meet the scope, time, and cost goals, also known as the triple constraint theory.

1.2 Research scope and research method

The scope of the thesis is limited to changes in the IT field. Further, only two Project Management models are inspected more closely, the stage-gate model and the agile model. Change management will not be included in this thesis, as it focuses its methods more on people management in organizational change. The same is true for disruptive economical change (e.g., Covid-19 pandemic, financial crisis in 2008) or inflation and deflation, which will be excluded. Legal and political changes will be excluded as well.

The research method used in this thesis is based on exploratory research, so the information will be drawn from articles, literature, and interviews with IT project management specialists. This method enables gaining a better understanding of the problem linked to changes in IT projects by analysing various sources. The inductive approach is used for analysing the above-mentioned data. Findings related to the subject, changes in IT projects, are then used to create the baseline for the interviews to collect the real-life examples on change.

1.3 Structure

The thesis is divided into two parts, the theoretical part, and the empirical part, a total of five chapters. In the theoretical part, the basis of Information Technology Project Management is laid out in form of definitions, as well as a more detailed description of the eight different performance domains provided by the Project Management Institute. In the empirical part, personal experience as well the interviews held and summarised to gain further understanding.

For the sources the reference software tool called Mendeley is used with its style 'Cite Them Right 10th edition – Harvard'.

2 Theoretical Framework

With the aim of understanding the characteristics of changes that affect IT projects, chapter 2 aims to explain the key terms and concepts which will function as the base for further analysis. Project Management is a broad topic and includes a lot of areas, therefore it is important to gain a holistic view of project management so the effects of changes can be studied in all areas.

2.1 Project

The first key term to be detailed is a project. A project can be defined as the creation of a unique product, service, or result during a specified time. Some of its attributes are the uniqueness and the uncertainty that accompanies each project. This increases the difficulty to clearly define the objectives, as well as the uncertainty caused by external factors including the pace of change of new technologies (Schwalbe, 2009). The Project Management Institute (PMI) associates projects with changes: "Projects, by their very definition, create something new: they are agents of change" (Project Management Institute, 1996).

2.1.1 Types of projects

Every project is unique and there are as many types of projects as there are projects. In this thesis, only two types will be further elaborated. First are the software development projects. The goal of a software development project, as indicated in the name, is the development on a software, be it system, programming or application software (IBM, 2022).

The second type of projects addressed are IT projects. This broader term involves most of the IT projects, as the purpose of this type is to deliver a ready-made solution related to IT (software, hardware, or processes) to a business problem instead of developing every part of the software. Throughout the thesis, the term IT project refers to the second type, where the focus is put on ready-made software solutions that are still customizable.

Another aspect of project management is the organizational structure. There are three different types called functional, project-based and matrix structure (Marchewka, 2015).

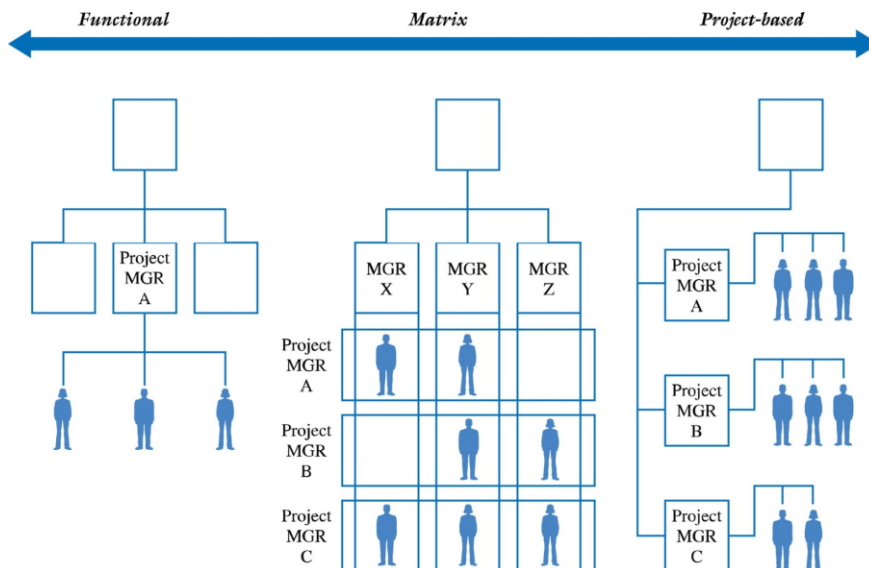


Figure 1 – Three types of organizational structure (Erickson, 2003)

The functional project organization groups the people by function. Often these functions are like different departments in a company, meaning there is an IT, finance, marketing, or HR function. Each of these units have a functional manager, responsible for the projects. The advantage of this type is the increased flexibility as well as the breadth and depth of the knowledge, as all members of this unit are working in the related field. The downside of this structure is the lack of integration, as it can lead to a silo mindset.

The organization is called projectized if the structure is organized by projects. The program manager is responsible for a product and is responsible for one or more different projects, each with their respective project manager. This structure clearly shows the responsibilities and authorities of the projects and has a high level of integration. Disadvantages are the isolation of projects and potential duplicates, as several projects can be led at the same time.

The last main structure is a combination of the first two, meaning there is a functional and a project manager. This helps to have the necessary knowledge of the subject matter as well as the knowledge and processes of project management. It also allows for a high level of integration. However, mixing the two structures can create confusion among the organization and conflicts within the organization (Hughes, 2019).

2.1.2 Scope

According to the Axelos study of 2019 failed IT projects cost \$50 - 150\$ billion in the United States alone. Not having proper scope management and defining it during the planning session is one of the factors which attributes to this problem (Bouchrika, 2021).

The definition of scope can be further distinguished between product and project scope. The PMI describes the terms as follows: "Product scope is the features and functions that characterize a product, service, or result. Project scope is the work performed to deliver a product, service, or result with the specified features" (Project Management Institute, 1996).

Having the scope not defined is not the only obstacle linked to the project's success. Although the scope is lined out for a project, the scope can increase more and more along the duration of the project, which is called a scope creep. Therefore, scope management must include a procedure for scope validation as well (Schwalbe, 2009).

2.1.3 Deliverables

Deliverables are outputs in a form of a product, report or result which are needed to incrementally complete a project, process, or phase. There is a difference between product deliverables and process deliverables.

Product deliverables in IT projects can be a prototype or a finished product (e.g., software system). Process deliverables can be documentations like the project plan, progress report or requirement analysis documents (Donato, 2021).

2.1.4 Maturity models

An organization's maturity level can be measured by analysing the approach, methodology and strategies used in the processes (pmsolutions, 2022).

Maturity models can be used to help an organization to improve their approach to processes. Several models consist of five different maturity levels, where the first one is describing the least mature and the last level is describing the ideal state of the process (Schwalbe, 2009).

One popular maturity model is the Capability Maturity Model Integration (CMMI). Originally developed for software, it can now be used to improve processes in software, a project or the entire organization. The model not only shows the different levels but also guidelines on how to integrate the improvement by setting goals and priorities (Schwalbe, 2009).

As seen in Figure 2, the CMMI is divided into six different levels, with each level building onto the previous one.

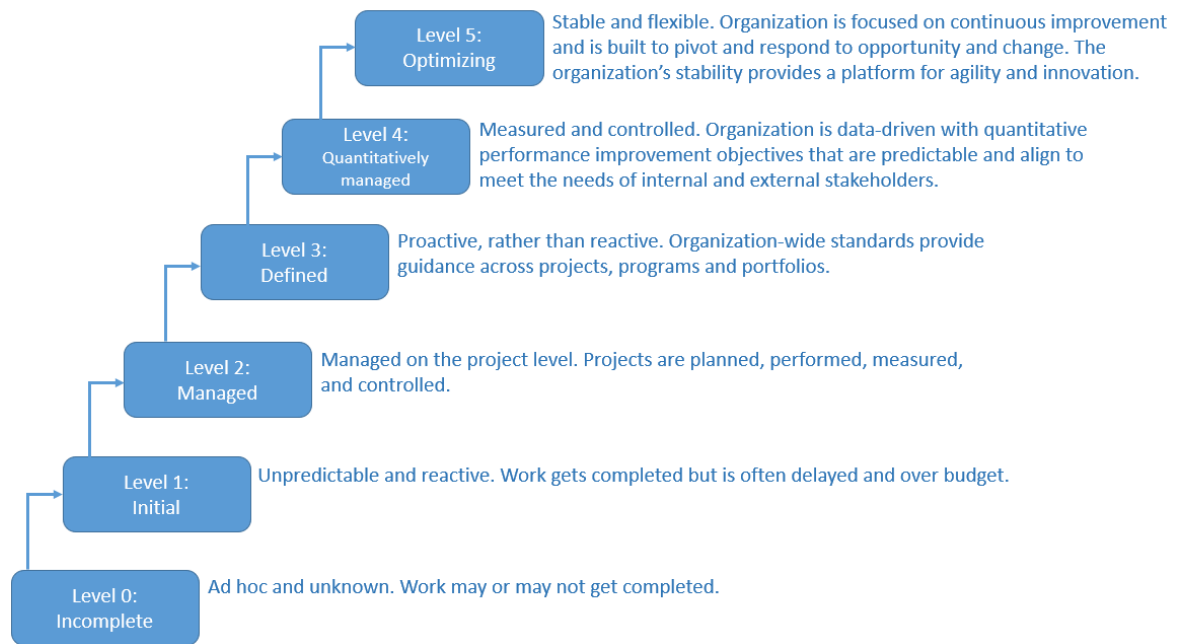


Figure 2 – Capability Maturity Model Integration (own illustration based on (ProcessGroup, 2019))

Several governments have public procurement processes, with some of them being so defined, that only companies can that have at least a CMMI Level 3 can make an offer(Schwalbe, 2009).

2.2 Project management

Project management is a discipline defined by the PMI. The institute defines project management in their guide as follows: “The application of knowledge, skills, tools, and techniques to project activities to meet project requirements. Project management refers to guiding the project work to deliver the intended outcomes” (Project Management Institute, 1996).

Projects operate within several boundaries, notably the boundaries of scope, time and cost, which is called the triple constraint theory in project management. Change in one area will also affect the others. It is part of the project manager’s responsibility to balance the constraints in alignment with the stakeholders needs (LaPrad, 2018).

2.2.1 Knowledge areas

In the sixth edition of their PMBOK® GUIDE from 2017 there are ten knowledge areas which are shown in Figure 3 below. Each knowledge area stands for a topic that is recurring in project management and contains processes associated with that topic.

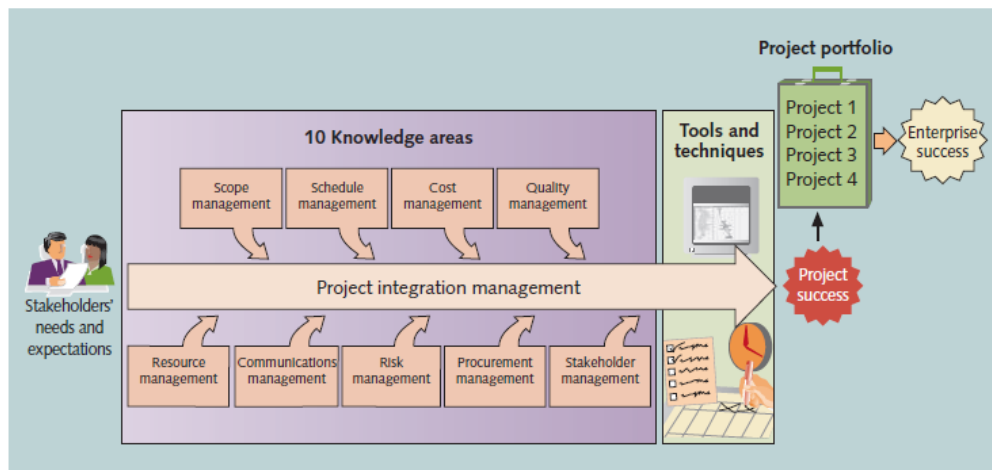


Figure 3 - Project management framework (Schwalbe, 2009)

Project managers need to be proficient within all areas in order to successfully complete a project. One area, the project integration management area, is particularly relevant for this thesis, as it relates to all other areas and can therefore be affected by all changes happening within these areas. This is why projects should not stand alone and require teamwork to be successful (Schwalbe, 2009). Therefore, working in silos should be discarded for working in collaboration with other departments. Project managers are advised to study how project interrelate within the company or its environment (Kiisel, 2010).

There is an emphasis on having comprehensive overview and linking areas and departments together since project teams need to have the whole system in mind in order to respond to the inevitable changes that will affect the project (Project Management Institute, 1996).

2.2.2 Project management plan

This knowledge is used to create a project management plan. The plan consists of all the documents that are needed to execute the projects, information on how and when to do specific tasks, but also what-ifs scenarios when dealing with uncertainty or changes. The plan is not only meant for project manager and the team members, but it should also offer the information needed for stakeholders and end-users (Rudder and Bottorff, 2022).

It takes time to create this plan but it is crucial so the plan can be used as a baseline for finding and controlling project changes. According to Schwalbe a baseline is a: “starting point, a measurement, or an observation that is documented so that it can be used for future comparison” (Schwalbe, 2009). Still, only 48% of respondents said that their project schedules are baselined most of the time or more (Wellingtone, 2021).

2.3 Project life cycle

A life cycle shows the different phases through which, in this case, a project passes (Merriam-Webster, 2022b). Meaning that projects can be separated into different phases, which mark the start and the end of a project. The generic life cycle proposed by the PMI, lists four different phases which are shown in Figure 4 in the next chapter “2.4 Project management process groups” along with its relationships. The project life cycle collects all the activities that are logically related to that phase. The phases, even though listed in the figure in a sequential order, can also be iterative or overlapping. The project life cycle itself can be predictive or adaptive.

A phase, which contains the development of the project, is called a development life cycle. Chapter 2.5 Development approach will elaborate the different approaches.

Defining the project life cycle allows to show in a bigger picture at what phase changes can occur and how these changes are affecting the other components of a project.

2.4 Project management process groups

Projects cannot be handled successfully without project management processes (Majeed, 2012). A process can be defined as using a series of action to obtain a particular result. PMI defines project management process groups as a logical grouping of the processes that work to achieve the same goal.

Processes can be categorized by the five process groups or by the ten knowledge areas (Project Management Institute, 1996). Working with complex subjects like an IT project, it is helpful to structure and show the connections between the components. Figure 4 below shows the interrelationship of the ten knowledge areas, process groups and project life cycle.

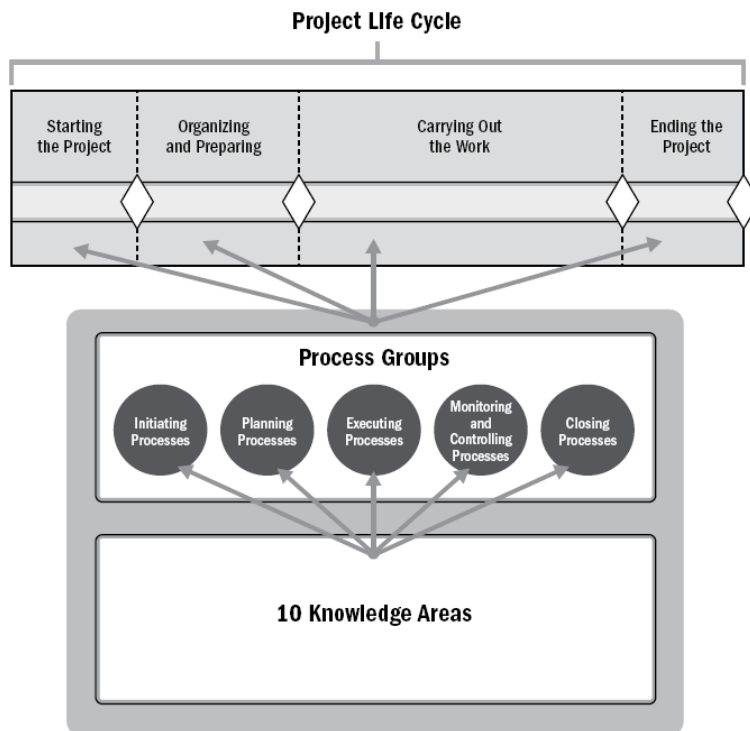


Figure 4 - Interrelationship of the ten knowledge areas, process groups and project life cycle (Project Management Institute, 1996)

The PMBOK® GUIDE offers a mapping of the knowledge areas with the process groups to display the relationship in detail. This means that every process group contains at least one activity related to a knowledge area.

Every phase in the project life cycle must contain all five process groups. The monitoring and controlling processes for example, is needed in every phase so the project manager is always informed about potential deviations (Schwalbe, 2009).

2.5 Development approach

There are five types of system development life cycles (SDLC), predictive, iterative, incremental, adaptive and hybrid (Schwalbe, 2009). For this thesis, two approaches will be discussed in detail, the predictive and adaptive approach. There is also a model which is situated in between the two called hybrid project.

The first elaborated is the predictive development approach, also called waterfall. The waterfall model was developed in 1970 (MidaGon, 2019).

The waterfall model includes phases in a well-defined order. Waterfall is considered to be more rigid, as all planning is done beforehand, and each phase is closed before the next one start. Figure 5 shows that the different phases of the predictive approach are executed one after one in the fixed order.

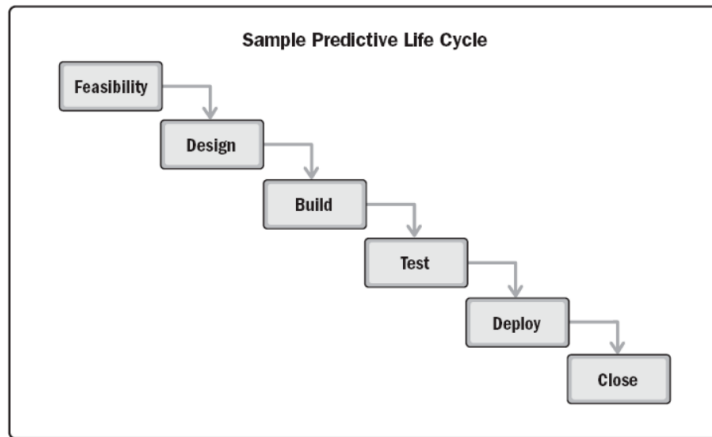


Figure 5 - Predictive life cycle (Project Management Institute, 1996)

The second to be defined is the adaptive development approach, or agile. This development model was introduced in 2001 by several system engineers (MidaGon, 2019). Contrary to the predictive approach, the adaptive approach consists of time-boxed iterations. In every iteration the phases of the waterfall model, with exception of the feasibility and closing phase, are executed.

Another big difference is that the customer engagement is higher in the adaptive approach as they are involved in every iteration for planning, testing and the acceptance of the developed product during the iteration

As shown in Figure 6 below, feedback from the customer is received after each iteration, which can lead to changes in the requirement. Whereas in the predictive life cycle, the project team obtain feedback very late in the development stage.

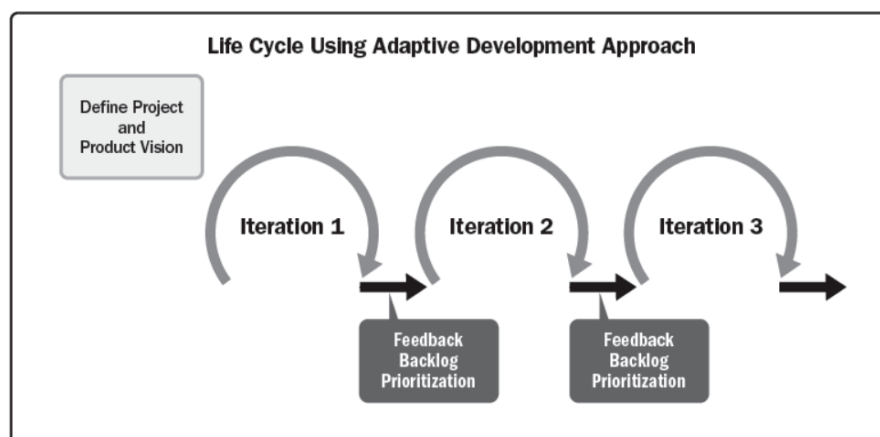


Figure 6 - Adaptive development approach (Project Management Institute, 1996)

The two system react differently to changes and it is important to decide upfront on the right system development life cycle depending on the degree of change in requirements to be expected in the project.

Another way to compare the two approaches is by showing the differences on how the requirements are handled in batches. In the next two figures below, alternative models of the predictive and adaptive approach are shown.

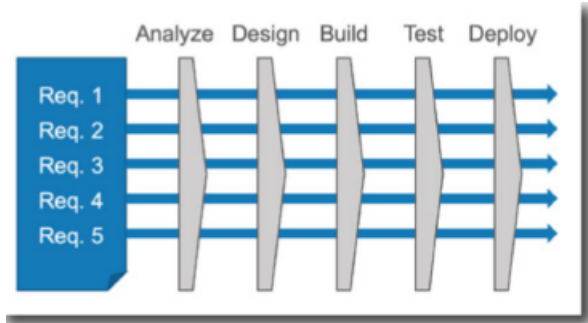


Figure 7 - Waterfall project with all requirements moving together (MidaGon, 2019)

In the agile process, the requirements are ordered by priority and then go through all the phases from analyzation to deployment.

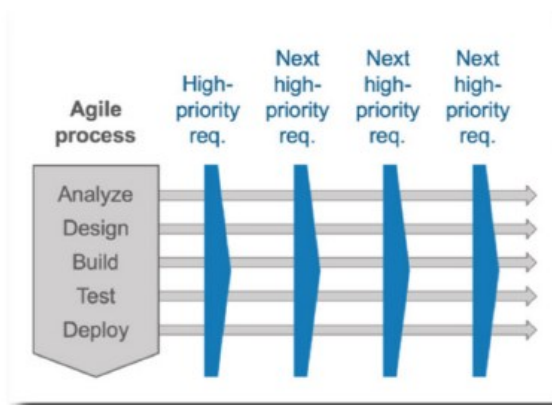


Figure 8 - Agile development (MidaGon, 2019)

When combining the two approaches, the first steps are done in a predictive way, whereas the development can be in an adaptive approach. The hybrid approach allows to have the functional perspective while still maintaining the agility during the development. In figure 9 below, the hybrid project model is shown.

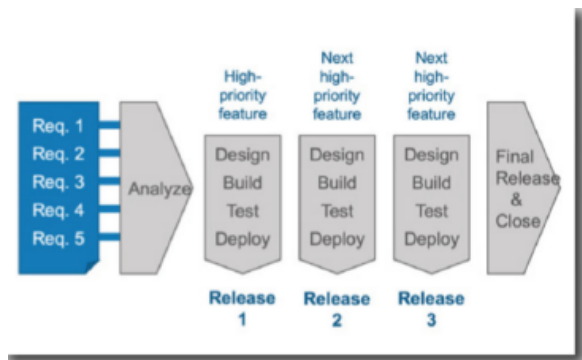


Figure 9 - Hybrid project with execution in sprints (MidaGon, 2019)

There is no one solution when it comes to project management. Depending on the solution, the organization and subject matter domain, one approach can be more suitable compared to the others. Project managers must have a deep understanding of the different approaches to be able to choose the most suitable one for every project.

2.6 Stakeholder

A stakeholder is an individual, group or organization whose interests are affected by the project. The meaning can be derived from the name as stakeholders hold “a stake” in the outcome. It is important to identify and manage the different stakeholders throughout the project, as they can influence the project positively or negatively. After identifying all stakeholders including their needs, they should be prioritized so the engagement of the key stakeholders can be assured which will contribute to the project’s success (HEAGNEY, 2016).

2.7 Change

As this thesis focuses on changes, it is necessary to define this term. According to an online dictionary, the meaning of change is to become different, or to undergo a transformation transition, or substitution (Merriam-Webster, 2022a).

In regard of project management domain, the Information Technology Library (ITIL), which lists best practices in IT services, defines change as follows: “A change is the addition, modification or removal of anything that could have a direct or indirect effect on services” (Agutter, 2020).

2.7.1 Cost of change

Project managers spend a lot of time on change as they are a considerable part of managing a project. It is crucial to strive for a high level of mastery in change management, as the

later a change occurs in the project life cycle, the more it will cost to fix it. The figure below shows the cost of change curve (Project Management Institute, 1996).

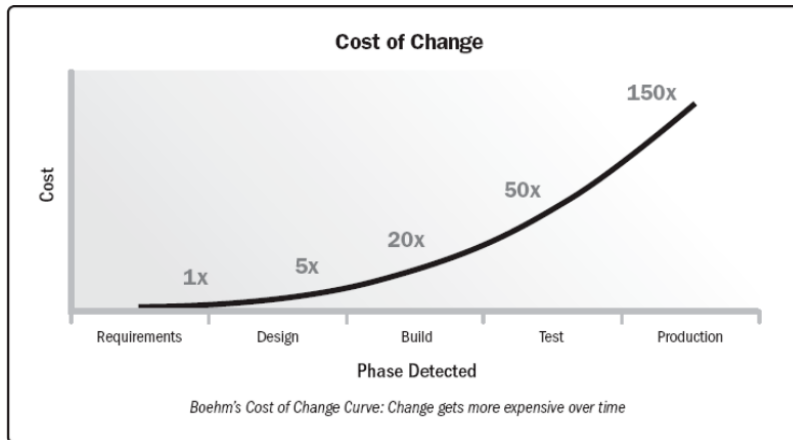


Figure 10 – Cost of change curve (Project Management Institute, 1996)

As shown in Figure 10, if an error is discovered in the testing phase, it can cost fifty times more compared to its discovery in the requirements phase. For that reason, project managers need to proactively create quality processes throughout the project life cycle (Project Management Institute, 1996).

2.7.2 Change type

There are three change types proposed, standard, normal, and emergency changes. The table below lists the changes ordered by their level of urgency.

Change type	Urgency	Description
Standard change	Low	Low risk and preauthorised. Are well documented.
Normal change	Low – medium	Are handled with change request processes which indicated that they need to be scheduled, assessed, and then authorised.
Emergency change	High	To be handled as quickly as possible, even at the potential expense of lack of assessment and authorisation.

Table 1 - Change types (Agutter, 2020)

2.7.3 Integrated change control

To have the change control integrated means that the process of identifying, evaluating and then managing changes during all phases of a project's life cycle. Documents resulting from

this process are approved change requests and the updated version of the project management plan. Ideally, all changes small or big, are documented by the project manager. In the case of significant changes, the project sponsor should use a formal process to analyse and deal with the change (Schwalbe, 2009).

2.7.4 Change control on IT Projects

IT projects are especially prone to changes. A survey from 2020 indicates that 67% of organizations incorporate change management in their actions, showing how crucial this part is to achieving success (Anthony, 2022).

There are two important documents to surveil changes in IT projects. The first is the work performance report which indicates from the baseline where the projects stands and if there are any deviations. The second one is the change request, a document that separates the changes in three different action types as shown in table 2 below.

Change request type	Description
Recommended corrective	Should result in improvements in project performance
Preventive actions	Reduce the probability of negative consequences associated with project risks
Defect repairs	Involve bringing defective deliverables into conformance with requirements

Table 2 – Change request types (Schwalbe, 2009)

Other important tools for managing changes are the change control system and the change control board (CCB). The change control system is a documented process which indicated when and how changes can be made on documents. The CCB are the people that are approving or rejecting the proposed changes, as well as seeing through of the implementation of any approved changes. This board could include the roles of the project manager, experts, project sponsor and customers. However, organising a meeting of the board for every change is time inefficient, therefore it is crucial to identify the base schedule for the board. This can be weekly or monthly or it can be different according to the change type mentioned in the beginning of chapter 2.7 Change (Schwalbe, 2009).

3 Project Performance Domains

In the 7th edition of the PMBOK® GUIDE from 2021 new sections were proposed to enhance the project success. One of them are the eight project performance domains, which are listed including the principles they are based on in Figure 11, below. Principles of project management which were established in earlier editions, function as a guide for the domains. Principles are described in “The Standard for Project Management” as the fundamental norms, values, or truths and guide the behaviour, whereas the project performance domains are areas where that behaviour is demonstrated (Project Management Institute, 1996).

The aim of this thesis is to gather practical real-life examples of changes that can affect a project. As the types of changes are as endlessly numerous, the scope had to be limited to a certain amount. The eight project performance domains proposed by PMI had been chosen after extended research, as these themes were showing up time and again in different literature.

They will be used in chapter 4, the empirical part as the foundation for the interviews, in order to have real life examples to each domain.

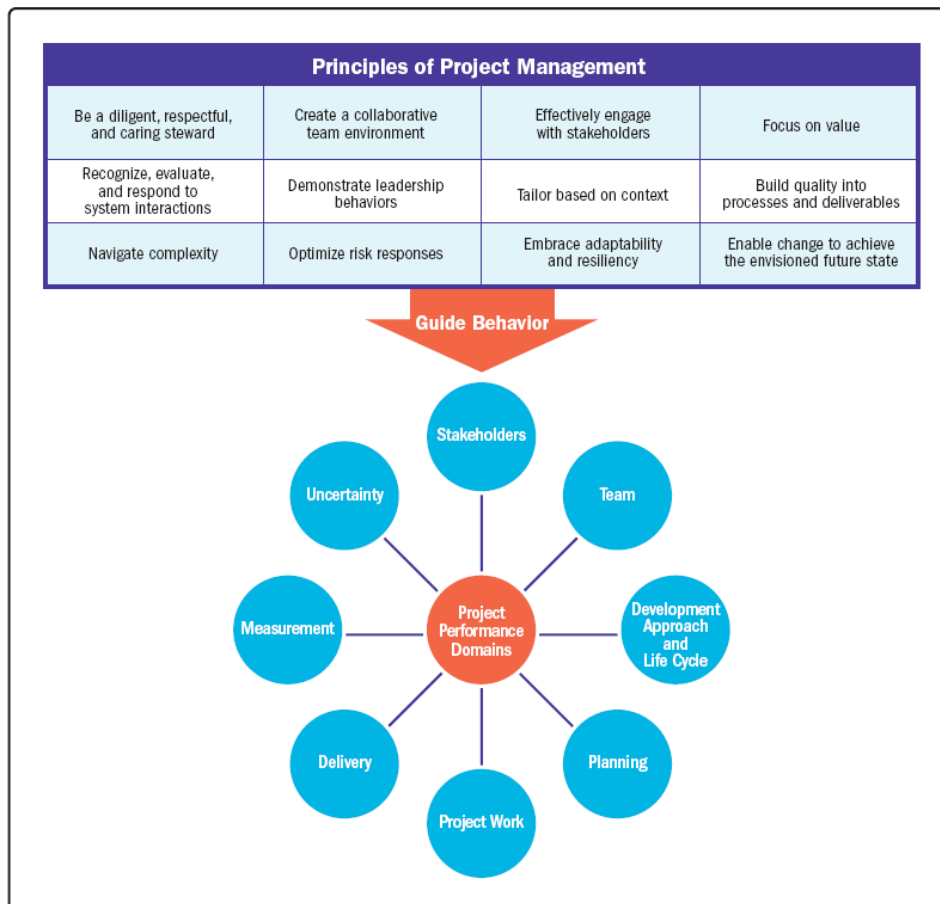


Figure 11 - Project performance domains (Project Management Institute, 1996)

In order to answer the research questions, it is crucial to gain better understanding of the project performance domains. This will also help in getting on the same page as the interviewee, to get the most relevant best and worst cases.

PMI defines the domains as follows: “A project performance domain is a group of related activities that are critical for the effective delivery of project outcomes. Project performance domains are interactive, interrelated, and interdependent areas of focus that work in unison to achieve desired project outcomes” (Project Management Institute, 1996).

The following eight subchapters summarize each domain based on 7th edition of the guide. The desired outcome if the performance domain well managed is listed first, then the activities or functions that can favour this positive result.

3.1 Stakeholder performance domain

When this performance domain is effectively managed, the working relationship with the stakeholders is productive. The number of changes to the project coming from the stakeholders is within a foreseen range, as the stakeholders agree and support the project with their behaviour.

PMI indicates that stakeholder engagement is the implementation of strategies and action to reach the desired outcome for the domain. They propose six different steps, as shown in the figure below, which should be done before the projects starts and should be maintained during the project’s life.

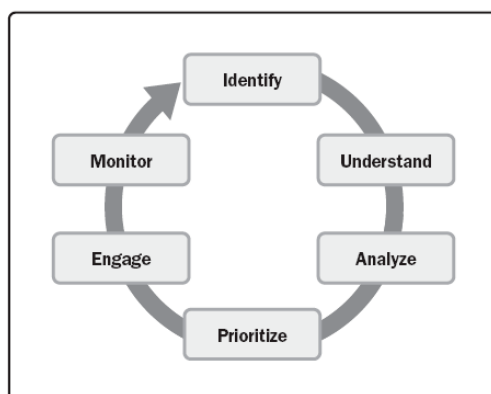


Figure 12 – Six steps for effective stakeholder engagement (Project Management Institute, 1996)

The first step is to identify the stakeholders in a detailed manner, so the non-high-level stakeholders and their needs are identified as well. Once all stakeholders are identified, the

next phases are to understand and analyse the stakeholder's attitude, values, impact, and expectations, as well as other aspects. Prioritization comes after the previous step, where the focus often lies with the stakeholders with the most interest and power, followed by engagement, where soft skills are needed to properly manage all communication flows. The last step, to monitor, ensures that the previous actions for effective stakeholder performance is maintained throughout the whole project by repeating the first five steps.

3.2 Team performance domain

The desired outcome for this domain is a high-performing team that collaborates, and values trust and empowerment, that shares the vision and objectives of the project. Activities leading to a high-performing team include leadership activities that focus on people, as individuals as well as a team. The leadership style must be adapted with every new project. There are many variants of organizing a team. When it comes to management, it can be centralized or distributed. In centralized management the accountability is often assigned to only one person. If distributed, the project team self-organize and therefore share the accountability (Project Management Institute, 1996).

Independent on how the accountability is distributed, having professional project managers is crucial. But a study showed that only 47% of the projects were most of the time or always led by such professionals. As the number of projects, especially small ones that are organised in an informal way, the need of more project management skills was stated by 71% of the respondents (Wellington, 2021).

When a team is created, a culture around it will develop. This can be done deliberately by norms, or it can develop by the behaviour of the members. The culture of an organization should not be underestimated, since having a strong culture creates stability for the organization. But if too strong, it will backfire as being too stiff and makes changing behaviour more difficult. Finding the balance is necessary for efficient project leaders, so the more they have an understanding about the culture of the company and the project team, the more effective the project manager can lead the team (Suda, 2007).

3.3 Development approach and life cycle performance domain

This domain is well managed, when the right development approach is selected. This will facilitate the project's successful conclusion while considering the different needs of the stakeholders. One activity to help this domain to fulfil its potential is the delivery cadence, the frequency of project deliverables, which can be single, multiple, or periodic delivery.

Another activity to support the right selection of a development approach is to consider the different categories listed with their subsection in table 2 below.

Category	Subsection
Product, Service or Result	<ul style="list-style-type: none"> - Degree of innovation - Requirement certainty - Scope stability - Ease of change - Delivery option - Risk - Safety requirements - Regulations
Project	<ul style="list-style-type: none"> - Stakeholders - Schedule constraints - Funding availability
Organization	<ul style="list-style-type: none"> - Organizational structure - Culture - Organizational capability - Project team size and location

Table 3 – Categories to consider for selecting a development approach (Project Management Institute, 1996)

Being aware of the situation in all subsections will influence the choice of the development approach.

3.4 Planning performance domain

It is of great interest having this domain well executed, as the planning is linked throughout the project's life cycle and not only in the initial phase. The benefits are various, reaching from coordinating the overall progression of the projects to the fulfilment of stakeholders need. Proper planning allows to generate the necessary information to be used for adapting to changes. According to the 2021 Wellington report, planning delivers notably additional value and is not difficult to implement. As shown in the figure below, the respondents of the study rated planning activities in the top three processes to be targeted.

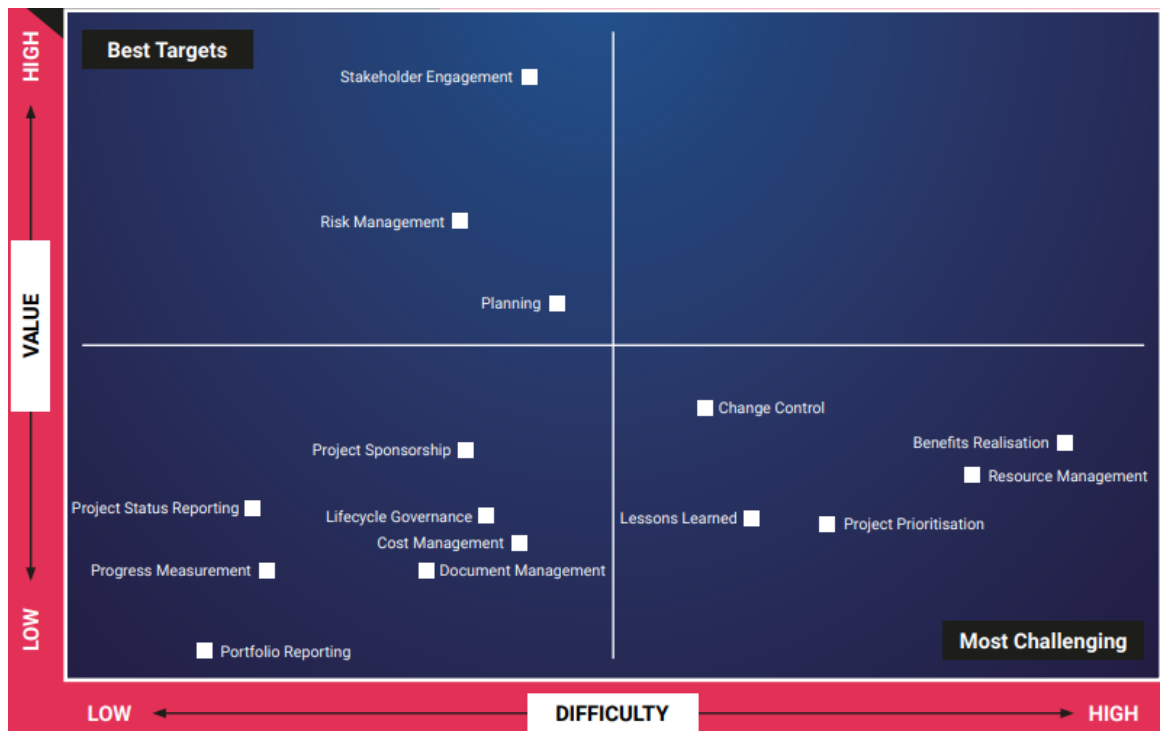


Figure 13 - Processes to add the most value (Wellington, 2021)

The difficulty level set by the respondents for planning is in the middle of the scale. Due to the uniqueness of each project, it is not feasible to establish a fixed guideline on how to execute the planning.

The development approach, the deliverables, the organizational structure, the market and legal or regulatory restrictions are some of those variables that influence the way project manager are supposed to create project plans. Each of these variables demand a different planning style, be it more up front, continuous or be it high-level planned or more detailed (Project Management Institute, 1996).

Whenever planning is done, estimation is used to forecast the resources needed and to create a project plan. But estimation has its limitations. It was shown that experts specified their range overconfidently (Laird, 2006).

With this performance domain it is important to allocate enough importance and resources as it can negatively impact the project's success when neglected.

3.5 Project work performance domain

Activities concerned about the establishment of project processes, management of physical and non-physical resources and creation of a learning environment belong to the project work performance domain. Project managers who master this domain have chosen appropriate processes which are efficient and effective, have few misunderstandings with

stakeholders and therefore can count on their engagement and have great resource management.

Using the maturity level as a roadmap to improve processes is good strategy. But according to a recent study, 45% of respondents were either somewhat or very dissatisfied with the project management maturity of their organisation (Wellington, 2021).

Managing the resources of a project requires considerable planning, whether these resources are internally available, need to be supplied from third parties, are physical or non-physical. Each resource type requires a system so there is no gap or unnecessary resources left in the process. One way to minimize potential waste is to have processes for knowledge management, where the project team elaborates the lessons learned, so they can implement them in the future (Project Management Institute, 1996). To support the learning process there are specific learning management software (LMS) available. According to one study from 2020 interviewing learning & development departments in North America, 70% of the respondents used LMS for training, which is a 17% increase from the previous year (Eira, 2022).

3.6 Delivery performance domain

The wanted result of any project is to deliver the defined scope while respecting the triple constraint and the quality. This domain focuses on the alignment of the project with the organization's business objectives. This alignment is of great importance, as a software project failure statistic indicates that 44% of the projects failed, because the alignment between business and project objectives was missing (TeamStage, 2022). If the project team manages to align the goals, stakeholders are more likely to accept the project's deliverables and are content with the result.

Managing the requirements well, can facilitate a positive result. The requirement management process can be the same for both development approaches, predictive and adaptive, but it will be repeated more often in the latter. Once the requirements are defined, the scope can also be defined that matches the detailed requirements (Project Management Institute, 1996).

To further break down the scope into manageable tasks, the work breakdown structure (WBS) can be used. This makes the project manageable and structured, as the tasks provide a clear roadmap for the project team. When the definition of done (DOD) is defined at the same time, the quality of the tasks is guaranteed to be satisfying (Schwalbe, 2009).

This performance domain is essential to manage well, as the deliveries act as the foundation for other performance domains.

3.7 Measurement performance domain

Effective management of measurement performance means that the project team and its stakeholders have reliable information about the project performance and if there is a deviation from the target, the project teams take timely and appropriate actions to get back on track. Another factor that shows the importance of this domain is its interaction with three other domains, that were introduced earlier, the planning, project work and delivery performance domain. The next domain, the uncertainty performance domain under chapter 3.8, can start its activities based on the measurements that this domain will produce (Project Management Institute, 1996).

Creating a strong foundation for this performance domain, like having access to reliable information, is unfortunately not the reality in most companies. In one study it shows that 47% of the respondents cannot see the real-time information about the project's performance. For the time efficiency, half of the interviewed people said to be spending one or more days to gather this crucial data (Wellington, 2021). Reliable information in a company is synonymous with high data quality, because poor data quality can cause enormous costs, with \$15 million according to the Gartner's Data Quality Market Survey (Moore, 2018).

Being able to produce reliable data is not enough. There are various activities that are associated with this domain, for instance the activity to decide on which metrics to focus. Only the data that will prevent inadequate performance, facilitate a decision or generate information for the project team to learn, as well sufficient information for the stakeholders, should be measured (Project Management Institute, 1996). The risk today with big data is the overwhelming number of potential metrics. Therefore, choosing a minimum number of measurements is essential (Harpham, 2021). Another relevant activity is the presentation of the obtained information. It is most useful, if it is accessible, timely updated and presented ideally in a visual way like a dashboard (Project Management Institute, 1996).

With the connection to the other performance domains, it is crucial to generate accurate data, that will be used to see the progress from the set baseline. However, there are several common pitfalls that can falsify the measurements. For example, the Hawthorne effect states, that as soon as one focuses on measuring something, the behaviour is influenced. Even if the data is accurate, it can either be a vanity metric, meaning that the data is not providing

any useful information or it can later be corrupted by confirmation bias (Project Management Institute, 1996).

3.8 Uncertainty performance domain

Uncertainty is no stranger to project managers, yet this very term is ambiguous, as in one study 32% of the interviewed people used uncertainty synonymous with risk and stating that risk always had a negative impact on the project (Lechler and Edington, 2013). Before elaborating the desired outcome for this performance domain when it is effectively executed, several terms taken from the PMBOK guide, are relevant to be defined and therefore listed in table 4 below.

Term	Definition
Uncertainty	A lack of understanding and awareness of issues, events, paths to follow, or solutions to pursue
Ambiguity	A state of being unclear, having difficulty in identifying the cause of events, or having multiple options from which to choose
Complexity	A characteristic of a program or project or its environment that is difficult to manage due to human behaviour, system behaviour, and ambiguity
Volatility	The possibility for rapid and unpredictable change
Risk	An uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives

Table 4 – Definitions relevant to the uncertainty performance domain (Project Management Institute, 1996)

This table of terminology can also serve as the foundation for the desired outcomes. If this domain is well managed, the awareness of the environment of the project (e.g., technical, market, political, social and economic environments) as well the awareness of the complexity of the project is raised. There are plenty of actions and tools available to proactively look and respond to uncertainty. One way to respond to uncertainty is by gather a lot of information and prepare not only for one solution, but solutions for multiple outcomes (Project Management Institute, 1996).

To tackle the complexity of any project, but especially in software development, simulations and decoupling are found to be useful, even though they need resources which do not translate directly into tangible features (Lowell and Lainfiesta, 2020).

If an unanticipated situation arises, project manager should check if this uncertainty can be transformed into an opportunity and thus creating additional value for the project. This

process is depending on the willingness of the organization to fail on some of the set project goals, as well as on great leadership skills, as uncertainty create a lot of changes and are therefore difficult to manage (Lechler and Edington, 2013).

The development approach also indicates the level of uncertainty. Whereas in the predictive approach the uncertainty is kept to a lower level, in the adaptive development approach the uncertainty plays a big part. Especially in software projects, estimates that lie to far in the future can be very inaccurate and only by moving closer to the end of the project, predictions become reliable (Döbrich, 2020).

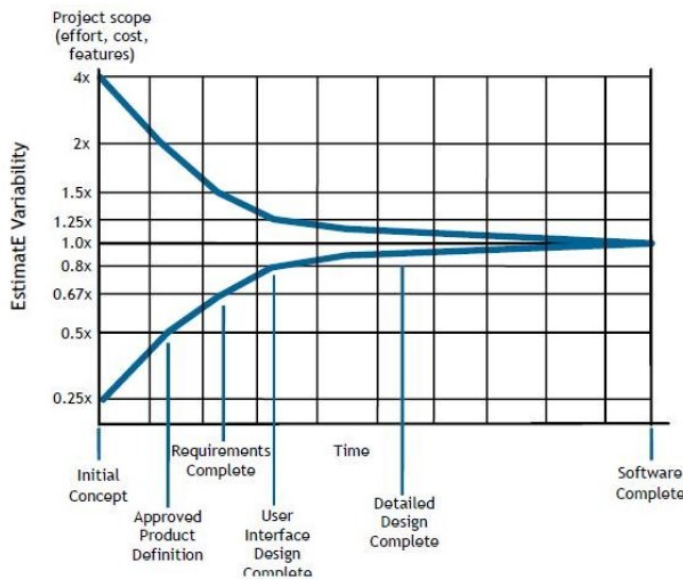


Figure 14 – Cone of uncertainty by Steve McConnel (Hamzeh, 2022)

As shown in the figure above, the variability factor in the inception phase is significantly higher than in the construction phase of the project.

4 Empirical Part

The aim of this chapter is to collect qualitative practical examples related to the different project domains. This will be done by conducting interviews with professionals working in IT and software development projects. In contrast to the first part, the theoretical framework, this part is based on empirical knowledge. Empirical knowledge collects direct experiences as they occur, without any imaginations or hypothesis (Noor u Deen, 2021).

The purpose of doing research is not to simply collect data without stating a clear purpose. The research method used in this thesis is basic research, meaning that the collection of knowledge and findings about the project management are the main goals. Even though the real-life examples from the interviews can be beneficial for practitioners, it cannot be considered as applied research, where knowledge or the solution to a particular problem are presented (Saunders, Lewis and Thornhill, 2019).

To fit this thesis's research question, the qualitative approach has been chosen, opposed to the quantitative approach. The difference between the two is the perspective. Whereas the quantitative approach uses large numbers of findings to be able to generalize the findings, the qualitative approach uses fewer study objects but goes more into context and perspective of the individual (Lapan, 2011).

Choosing the qualitative approach in economics is less prominent, as this field is in favour of the quantitative research where the numbers can be used in mathematical models and statistics (Moran, 2020). There are also critics of the qualitative interviews, which state it is not scientific, that findings may be biased by the interviewer's opinion and that it cannot be generalizable for a larger group or organization, since the number of subjects is too small (Kvale and Brinkmann, 2018).

However, given that the result of the interviews, the real-life examples per domain, is often elaborated and longer than just one sentence, the qualitative research is the best methodology for this thesis. An additional argument why qualitative research is better suited than quantitative, is the complexity of the real world. Even if it were possible to create a model or generalize findings, comparing them with the reality of the people they won't probably fit into the created models. Therefore, more information can be drawn from fewer interviews (Moran, 2020).

To obtain a richer set of data, the collection of examples relating to the eight different performance domains is based on two parts, the first being the researcher's personal

experience of having participated in project management in different projects. The second one, are actual examples drawn from the conducted interview with project managers.

4.1 Personal observation

In this chapter examples from the researcher’s personal experience will be drawn from three different IT projects. The researcher’s roles were diverse, reaching from assisting the project manager, conducting user testing, developing the software, to leading the project as a scrum master. All projects were using the adaptive development approach with the Scrum method. A summary of the projects with the role, change frequency on requirements as well the project type is listed in the table 5 below.

Having less than five year of project management experience, this subject cannot be considered as experienced, therefore it was not possible to collect information on all performance domains.

Project	Roles	Changes on requirements	Project type	Estimated maturity level
Project 1	Assistant to project manager, testing team	Few changes	Software development	Level 3: Defined
Project 2	Development team & managing development team	Few changes	IT project	Level 1: Initial
Project 3	Scrum master, development team	Several changes	Software development	Level 2: Managed

Table 5 – List of projects where researcher has participated

Stakeholder performance domain

In two of the projects, the stakeholder engagement reached from very to almost no engagement. This level was then translated especially to the schedule and therefore to the cost constraints. In project 1 the stakeholders which had the biggest impact on the project, considered it as low priority and spent little time in reviewing the sprints. This resulted in having to deal with little changes, as feedback was scarce, but it negatively impacted the working morale of the team as well as the schedule & cost. The time and effort needed to get feedback and crucial information to move forward with the project were high.

In project 3 the most critical stakeholder, which was the product owner, showed particularly interest and engagement in the success of the project. This translated in regular conversations and reviewing of the sprints, which in turn generated a lot of feedback and change requests from the product owner. Due to this engagement, several smaller

adjustments were made to the software which translated in an overall continuous progression of the project.

Team performance domain

The biggest obstacle in project 2 was the team culture where leadership skills were missing. Consisting only of three members, the lack of guidance and willingness of taking responsibility and accountability was making the collaboration with other development teams and the product owner difficult. In project 3, the culture was having a positive effect on the project's success. In this project, the management activities were distributed to all members and there was a focus on growth for every member. For both project, there was a direct correlation between a positive team culture and the successful advancement of the project.

Development approach and life cycle performance domain

For this performance domain, project 1 used multiple deliveries for the software. In project 2 and 3 there was a single delivery at the end of the project. Due to limited experience, there is no valuable insights can be drawn.

Planning performance domain

The inexperience and no clear leadership of the team members in project 2 led to an incomplete planning. There was initial planning in the beginning of the project but in hindsight, it was too high-level and there was no clear baseline, therefore measuring the progress was challenging. In this project a more detailed planning with a work breakdown structure (WBS) would have enabled the team to work more efficient.

In project 3, notable time was allocated in every sprint for planning. This allowed the team to create a detailed WBS and discuss the distribution of the tasks to the different members. Having invested enough time in project 3 for planning, translated into a continuous progression of the project. Based only on the three projects, the more time was invested in planning, the better the project work progressed.

Project work performance domain

The performance of the three projects can be linked accordingly to the maturity level of the team and/or organization. The more mature processes were, the more stable the team progressed. Putting emphasis on creating processes for lessons learned equally converted into project success. Project 3 was the project with the highest learning curve, as all members shared a culture of learning, and the domains of knowledge were distributed between the different members.

Delivery performance domain

Due to the adaptive development approach, in all three projects there were no big deviations from the requirements and proper requirements management was implemented. Missing from the researcher's point of view were a clear understanding of the business objective and the generated value. For all projects, there were no follow up processes established that would show whether the project added more value for the business and if this added value serves the overall goal of the organization.

Measurement performance domain

For every project the measurement of the project progress was done with the Kanban method where all the tasks were broken down into WBS. Even though the same process was used within all projects, there were significant differences in performance. Project 1 had very detailed levelled tasks, project 2 very high-level and project 3 was in between. In project 1 there was emphasis on respecting the internal Kanban process, which led to the tasks being properly recorded and updated. In hindsight, the project team with the most mature processes had the best access to the status of the project and could act accordingly.

Uncertainty performance domain

The researcher did not have access to the risk management or discussions happening on the high abstraction level of the projects. Therefore, no personal observation can be attributed to this performance domain.

4.2 Interview

An interview is a conversation which serves a specific purpose and involves two or more people. These people should not be chosen at random but be systematically chosen through the sampling process. Choosing eligible respondent are crucial for qualitative interviews. The nature of these interview is a very in-depth exploration, where the interviewer encourages the respondent to speak freely about the questioned topic (Oishi, 2003). The criteria for the selection of the interview partners were based on the years of experience in project management in the IT field. For a wider variety, project managers from two different countries were chosen.

There are different types of research interviews depending on the level of structure and the number of participants in the interview. The three types are called structured, semi-structured and unstructured or in-depth interviews.

The structured interview is the most standardized, as it uses identical sets of questions, as opposed to the unstructured interview, where there are no fixed questions or prepared

topics. The interviewees have then the opportunity to speak freely and in-depth. The semi-structure, also referred to qualitative research interviews, lies between the structured and unstructured interview. In the semi-structured interview, there is a theme and some key questions which help to guide the interview and allows the interviewee also the opportunity to elaborate more on the questions (Saunders, Lewis and Thornhill, 2019).

The type used for the following interview is the semi-structured type, as it fulfils the needed criteria of having given the participant a lot of room to talk freely but on the same time being structured to obtain information on all performance domains. All interviews conducted for this thesis took place during the month of August 2022 and are transcribed with a software called Descript. The interview duration lasts between one hour and one hour and a half. To help structure the interview, a PowerPoint presentation was shown to the participants. In the following subchapters, the stories and experiences drawn from the interviews are summarized by the researcher.

Before conducting the interviews, the questions as well the PowerPoint presentation were tested on another person to indicate the time and ensure the flow of the interview. The participants were asked for permission to record the sessions.

The expected result before conducting the interview is as follows: the eight project performance domains are present in every project but behave differently from project to project. Therefore, it can be assumed, that the examples given will be very diverse and similarities are rarely shown. This chapter is divided into the separate interviews, structured in the order of the time they were conducted.

4.2.1 Interview 1

Interviewee's background

Participant 1 is working as a business consultant and project manager for twenty years. The participant took one course on project management at university, but beside this course no further certification and gained all knowledge from direct experience by having worked on several projects. The interviewee deems the hands-on learning approach the best, compared to formal education at a school.

Project Management processes

The project management tools are based on what the client's organization provides. The company of participant 1 sends one consultant to the client's team, hence the consultant uses the client's tools.

Change definition in projects

According to the interviewee, there are a lot of things that can change and the longer the project is running, the higher the possibility that a change will occur. Often the scope, the needs and requirements will change. What is going to be build and for what purpose can also change and this will have a great impact on the methodology.

In a project where the deliveries are specified in detail up front at the very beginning of the project, there it becomes more difficult to make changes further down the road. This project methodology relies on the assumption that the “what” and the “why” of the project are known. Also, the more fixed engagement there is with vendors, prices or scope contracts, the more complicated it is to make changes. This described approach, where there is a big plan upfront is typically called the waterfall approach.

In contrast to this methodology are the agile methods, where changes are expected. In an agile approach, the scope is divided in several small pieces where the deliveries which generate the most value are developed first. This makes the rest of the scope flexible.

The interviewee states that change is a typical occurrence in project management and that the understanding of the project is always evolving. Besides requirement needs and scope, there are other factors that can change, like the team members or budget.

Stakeholder performance domain

The participant was working on a project for a banking client to implement a new software. This software should improve their credit process, which included loan requests and proposals. There were two significant changes. The bank had already selected a vendor for the software, but upon further examination of the capabilities and the data model it turned out that this vendor was not a good fit for the banking company. As a consultant, the interviewee and his team started to look for alternatives and found another, more suited vendor. This change led to a better result, especially since the vendor change was done in the early phase of the project. There was of course time lost on having to go through the procurement process for the new vendor but overall, the change made had a positive impact. Even though the result was better, it made the stakeholder setup more complicated. The second change was linked to the first, because this new vendor happened to provide other banking solution software, as credit analysis and scoring, which the bank needed. Therefore, there were at least two different teams establishing a procurement process for the same vendor. The first team which was purchasing the credit process, the second purchasing the credit analysis and scoring process. The first team could not close the contract for the first service, as it had to wait for the other team. This resulted in a halt for the project of the first team, until the second team proceeded with the procurement process. The expectations varied for the different stakeholders, some wanting to proceed as quickly

as possible with the new vendor, others being more critical towards the vendor. In conclusion for this first performance domain, the credit process project slowed down considerably, but still managed to finish well.

Team performance domain & Development approach and life cycle performance domain

There was a project where the whole methodology and procurement model changed. It started as a waterfall project with a fixed price and a contract with the scope and one external vendor. The planning phase was very long and when the team started to develop, a big discussion and argumentations started within the team about the requirements, as they were vaguely specified. The client continued to add more requirements, which translated into more discussions within the team to create a quote the additional price. So, every time a change or new requirement came in, the team had to discuss, change, analyse the impact and agree on changes, which created considerably more work. This heavy process on change requests created a bad situation for the team. In the end, the decision was to cancel the project and start over with an agile approach. Having no fixed contract, scope and price, allowed the team to collaborate more with the vendors' team. The change of the development approach had a positive impact on the mood of the teams, their attitude and therefore the project.

Planning performance domain

The estimations of the work in this other project were not accurate and the planning was not extensive enough. The customer was getting and using data from an external data provider. This provider had a new version and it seemed that the project was consisting of technical change only. The interface was a REST API, connecting the different software, so the goal of the project was to switch the older interface with the new one. There were small changes on the data format which started to have bigger implications on other systems, even though the data looked the same, it affected other systems and the data warehouse. It turned out that changing the data format a little bit had big implication on the other teams, where collaboration was later needed to fix the problems relating to the new version. The planning in the original schedule did not include the needed assessment with other teams on the impact of the new data format.

Project work performance domain

Having discussed several processes on project management, the interviewee could not think of a situation where the maturity had influenced one the projects. One thing that came to mind was the company culture, which shifted from top down to more self-organization. In the beginning of participant 1's career, decisions were made by the steering committee,

which met on a weekly basis and slowed down the process. Now it is more common to empower the project's team members as much as possible, so they can make most of the decisions by themselves. Another positive impact is that the decision made by the project team are often better since they are closer to the actual project.

Delivery performance domain

To deliver a good result and added value for the customer, there must be a proper requirement management. Most of the time there are too many requirements, and they keep piling up throughout the project. One important task of a project manager is to go through them and decide which one are needed and which one can be dropped. One should not accept all requirements that are brought to the table but instead should be quite critical about the requirements and challenge them to see if they are really needed. Then, the interviewee brought up the importance of the development approach again, stating that working in an agile way is an elegant solution to discuss the most important requirements with the client. When asked, the respondent answered that the projects in the company are almost exclusively using the adaptive approach.

Measurement performance domain

The measurement of project progress is linked to the delivery performance domain. The best and most reliable way to measure progress is to look at the things that were delivered. Often there is a long requirement analysis phase and a long developing phase and until there is nothing implemented, it is difficult to know the project's progress. The implemented requirements must be tested and checked with the client's acceptance criteria. Using again an agile approach, the requirement goes through the whole cycle of implementing, testing, delivering and therefore, has been tested and accepted by the client. The client will also provide feedback to further improve the progress and the project.

The adaptive approach also helps with the estimation of implementation time by using the story point assessment. Story points assess the complexity and the amount of work on a requirement, using a reference story or requirement. Based on this reference, the implementation time for the other requirements can then be more easily estimated.

Uncertainty performance domain

The interviewee did not have a good or very distinctive example on uncertainty in project management, as uncertainty is a big part of any project, but offered instead different ways on how to approach uncertainty.

One way is to look on the uncertainty level of the scope, arrange the scope in a way that the safe bets are listed first and then start with the parts which are fairly certain. By implementing the safe bets first, time is gained for other uncertainties to resolve. But

generally, it is important to resolve uncertainties as early as possible. Another tool to resolve uncertainty is the experimental approach. If there are uncertainties about the customer's need, by implementing some capabilities and releasing one or several versions, customer's feedback will help resolve the uncertainty.

Uncertainty on the technology, whether it is viable or scalable enough, these kinds of uncertainties must be identified and resolved as early as possible. Testing should be done, before spending too much time on implementation.

Additional information on the performance domains

One thing the participant was missing from the PMI model of the performance domain was the importance of the core subject matter of the project. Project managers need to embody both, whereas this guide was mainly focusing on the generic part of project management. The questions "what is the problem?" and "what kind of solution is being developed?" need to be answered first. There is no need to be an expert, but a project manager must know the subject matter well enough to be able to lead a discussion and make the right decisions and be aware of implications these decisions will make. There should be no disconnection between project management and subject matter.

4.2.2 Interview 2

Interviewee's background

Participant 2, a certified scrum master, is currently working as an engineering manager. The participant is responsible for two software development teams and manages everything from inception to delivery of a product. The participant started as a software engineer and thanks to the qualities of leadership and organization, was put into this hybrid role of engineering and project management, for the last five years.

Project Management processes

The company of participant 2 is using a software called ClickUp, for project management. It is a sprint and task planning tool and uses the Kanban method.

Change definition in projects

Change can have a few dimensions, like changes to the product, to what is actual going to be built. This will translate in change of requirements and the goals. Other dimensions are changes in the market or change in stakeholders.

Change in process is another dimension, for example to increase the efficiency of a process. Or any change related to the organization or the people. The participant concludes that changes can be divided by impacts coming from the inside and impacts coming from the outside that influence the project.

Stakeholder performance domain

According to the interviewee, if there is a change to a project to be made, the most important thing is to convince all the stakeholders that are involved and change their mind to go in another direction. What the interviewee experienced in several cases where a stakeholder, who had a lot of decision power, was steering the project in an unfavourable direction. It then takes work to convince the stakeholder, explain why the team thinks that a different direction would be better for the projects' success.

In a recent project, the participant managed to persuade the product manager to invest more into quality instead of speed, which had a positive impact on the longevity of the product that they were building. In another project, the influence of stakeholders turned into a worse situation than anticipated. There, influencing of the main stakeholder was done too harshly, as the participant went directly to the boss of this main stakeholder to express the discontent. This created a huge dilemma and stress, which impacted the project even more negatively.

Team performance domain

In the previous organization of participant 2, there was a project, where the team was in a fairly dysfunctional state due to the members working against each other, lack of maturity and leadership. Most of the team members were very strong minded, too stubborn and not willing to loosen up and work together. Several team members were replaced with others, and this allowed the team's dynamic and the overall mood to improve. In the end the team even ended up having fun, and the whole attitude of the team had a great positive impact on the direction of the project.

According to participant 2, having fun in a team is one of the most important things, as other things become easier to work on. The project manager must think of creative ways to loosen the knot by choosing the right events, so people learn how to work better together and get to know and understand each other better.

Development approach and life cycle performance domain

Participant 2 has not worked in projects where the waterfall approach was used. This does not mean that the participant deems the predictive approach as bad, it just happens that in software projects it is rarely the case to be clear about the requirements. Most software projects involve a lot of uncertainty, so the adaptive approach is used with the Scrum, Kanban or Extreme Programming (XP) method. Choosing the right development approach depends not only on what is going to be built, but also on the team.

In one project, the interviewee was working in a highly functioning, mature and competent team. There was a lot of mutual respect, trust and no micromanagement. Working with this

high performing team, allowed them to move from Scrum to Kanban, so the sprints were removed and there was only a prioritized backlog. The project was very successful, as working in this way removed a lot of overhead.

Development approach and life cycle performance domain & Planning performance domain

This next example combines two performance domains. As mentioned in the domain before, the development approach depends on the maturity of the team. In another project of participant 2, the development team was not mature, so Scrum was followed more strictly, there was more time spent on estimating and planning. Sprint planning, for example, gives the team a framework to work.

Generally, the interviewee does not spend enough time on planning and finds it difficult to know how much planning is enough. The uncertainty makes it more difficult to properly estimate, as it often happens that the time allocated is underestimated. Also, the approach to plan a little, start working and figuring it out as the project goes, worked well until now. Since too much planning can be very expensive and in an agile approach, the plan will change again.

Project work performance domain

When talking about all the processes involved in project management, one should not forget the main goal of the project: the product that is going to be build. Everything else, the project management, the process, the planning, the team, the stakeholder, is secondary, incrementing on the product is the primary goal.

The interviewee states that it is possible to build an amazing product with one team member and no processes and that having a big team, with talented people and perfect processes can still lead to build software, which is not required and do not bring added value or is not used by the client. It had already happened, that a very expensive software was built correctly, but then only used by a few people. Or that a product was built, was it turned out that it was not needed. In big companies this happens more often that someone comes with a great idea, then you build it, spend a lot of money on this project and it turns out that this product is not actually needed.

Delivery performance domain

Increasing scope is something normal, but the project manager has to ensure that it won't get out of hand and has to be very proactive to reduce the scope and agree on a minimum viable product (MVP) to focus on. It is important to start with small pieces, deliver them and after that add on those pieces. The participant remembered that there were projects where requirement upon requirement was added, as the client changed a lot after each sprint, to

a point where the product had to be released as it is, due to time constraint. Regarding the triple constraint, first people change (or drop) the quality, then the scope, as the time and cost constraint rarely change.

Measurement performance domain

In participant 2's company there are quarterly plans which function as a baseline for success. They use the objectives and key results (OKR) tool on a product level. As for the estimations, they generally highly overestimate, for example, if they think that something is going to take two weeks, they estimate that it will take one month. There is also measuring done on a granular, task level. There the completion of the tasks is measured in a bi-weekly basis during the sprints.

Uncertainty performance domain

In a large project, involving the national railway service, uncertainty led to failure, as it was not handled the right way. The team tried to compensate the uncertainty with a lot of planning and when they thought that they figured out how the solution worked, it turned out to be the opposite case and the team noticed that they had underestimated the uncertainty, as this happened to be a large and very complex project. Wrong decisions were made too soon. The correct way to deal with uncertainty is trying to postpone the decision making to as late as possible. And try to make not expensive decisions. This was the opposite for this national railway project, where they put very strict solutions in the early phase of the project which made it very expensive or impossible to change at a later stage in the project. This was an example where the wrong way of handling uncertainty led to failure of a project. The participant thinks, that when agile is done in a right way, every uncertainty can be turned into an opportunity.

Additional information on the performance domains

The area where the participant thought was not elaborated enough, was the second performance domain, the team, notably around project management styles. The management style is based on the maturity of the development team. It was also mentioned that this theme was touching on all other performance domains, showing again the complexity of a project. One management style is the top-down approach, meaning that the manager decides what process is used, what is going to be delivered and decides on which task the team members are working. More and more common today, is the management style called servant leadership, where the team members are given more decision power. The servant leader still needs to influence the team, so the project proceeds in the right direction. And the participant wants to stress that a project manager should not think that

they know all solutions but should depend on the team and should enable other team members to make the solution together.

4.2.3 Interview 3

Interviewee's background

Participant 3 owns a company, which is offering consulting management for banking solutions. For the last twenty-five years and more, the participant has been working in project management and is Scrum certified. Participant 3's career started in technology, as a developer with a diploma in informatics and moved to more management tasks thanks to the many years of experience. Regarding career, the interviewee recommends young professionals to get the different certifications like Scrum or Scaled Agile Framework (SAFe).

Project Management processes

In a consulting company, the processes and tools used for project management are the ones that the client is providing. Consultants must be very open-minded and flexible, so they can adapt to the tools, reporting style and processes of their clients. Otherwise, the tools most often used are Microsoft software, Jira and their documentation tool called Confluence but rarely other project management tools.

Change definition in projects

Change is a reality, so the agile approach is preferred by the interviewee. There is an agreement which functions as the baseline and due to internal or external circumstances changes occur, and the agreement needs to be adapted.

Stakeholder performance domain

There was a project in 2019 where the customer requested an implementation of an onboarding solution. The main stakeholder was the compliance area, which had to define the Know Your Customer (KYC) questionnaire. There was a clear timetable and a fixed price contract and still after six months, this main stakeholder did not manage to provide the needed information and continued to change requirements. This project was using the waterfall approach, so in theory it should not have been possible to go forward without this information, but it went anyway. The client kept changing the scope and added requirements. At some point it was too expensive to implement the requested changes, as they were not agreed upon and the company of participant 3 had to engage a lawyer to get the money. The client was not respecting the connection of the triple constraint, they kept on changing the scope, without wanting to accept more cost and a longer deadline. This is an example where the stakeholder made the project fail, and the interviewee suggests that

if there is no project sponsor who is motivated, supporting, pushing decisions and is on the right power level of the company, there is no need to start the project. In the majority of projects, the project sponsor is one of the key parameters of a successful project.

Team performance domain

Another key parameter of successful project management is the team. It is important that the team shares the same goal and understanding, otherwise it will be difficult to go into the same direction. The participant experienced a case, where the responsible project manager was replaced with someone who did have other goals and leadership style. The new project manager did not communicate with the team and there was little exchange compared to the previous manager. As a result, the projects took much longer than before to complete, and therefore the cost increased. Going with the whole team in one direction and share the information throughout the team members is not an easy task to achieve, especially when working in big companies. To favour a positive result, the leader must delegate appropriately to the team and give members the responsibilities and the competence to work on the tasks. If given both, people are more motivated, as they feel trusted. In participant 3's experience, self-organized people work better, and it is more fun for everybody, compared to the classical top-down approach. Working internationally, the language can also be a hindrance in team performance, as not everyone has the same fluency in English, depending on the generation.

Development approach and life cycle performance domain

When asked, the participant used to work mainly with the waterfall approach, but over the last seven years only with the agile approach. The life cycle of a project consists of a start and an end date. For task management, it is important to close the task, even if it is only 90% done, it should not be left open. It is better to take out the remaining 10% and create a new task, so the other one can be closed. In the participant's opinion, the agile approach is the better one, but at the same time did not experience a lot of companies that were working with an agile mindset. Using sprints, does not make a company agile. The participant noticed that in some companies agile was synonymous to chaos, as they would stop to have documentation and structure, which is not what being agile means. Being agile means, acting flexible on change requests and other circumstances that require change. It is also difficult to be agile if the budget is fixed on a certain amount.

Planning performance domain

When working with the agile approach, it is important to spend enough time on planning. For example, if there is a project with six sprints and the interface can be done earliest in sprint 4, then there is no need to put a story regarding the interface in sprint 1. As an external

consultant, the collaboration with other companies often involves fixed price contracts. Therefore, it is crucial that planning considers the tasks with the most added value to the customer first. For example, the development team spends a lot of effort in developing the best user interface, but in the end the client goals are efficiency and automation. Regarding the priorities, one cannot expect the product owner to have all the knowledge, so the product owner may not know what story needs to be implemented at what time. This is why structure, and enough planning needs to be provided by the project manager.

Project work performance domain

Most companies with whom this participant has worked, were on the maturity level 2 to 4 of the CMMI. One of the advantages of being an external consultant to companies is that by just creating a fixed contract for the collaboration, ensures that the company has some minimal level of maturity. But even a high level of maturity does not guarantee good results, as some companies are now overengineered, meaning there are too many unnecessary reports, documents, guidelines and steps and checkpoints which hinder the performance. The approach needs to be approved by all stakeholders, so everyone agrees and the necessary quality gates.

Delivery performance domain

The interviewee was mandated by a bank in the car industry to do an outsourcing management project with a fixed price contract & deadline. But the client kept on increasing the scope by adding user story after user story. They managed to agree on the scope, but only four weeks before the deadline. That pushed the developing team to the limit and in the end, the mood within the team was tense and there was no room for any documentation. In another project, increasing the scope turned out to be no problem. This was kind of an ideal project and how the interviewee thinks projects should work generally. In the middle of the project, after sprint 5, the developing team noticed that there were still around ten to twenty additional stories left to develop after the last sprint. After discussion with the client, they acknowledged the importance of the missing stories and the client agreed to pay to extend the development for another three weeks. It was a fair and well managed process. In the end everyone was happy, there was no stress or negative emotions between people. The client was happy, as the amount paid was not too big and in exchange, they had received a good software, a good solution to make their customers happy too.

Measurement performance domain

The project manager has to develop a good “gut-feeling”, to sense how the project and the team is progressing. Before implementing the scrum methodology, it was harder to accurately know the project status, as some team members would not be very honest about

their progress. With the daily meetings in scrum, any deviation is shown earlier. Another aspect is when the team works remotely, it is easier to extract more information through body language. The participant experienced several times that other partners would promise to deliver something but would not do so in the end.

Uncertainty performance domain

Any project is a form of uncertainty, especially in IT projects where more than half of the projects fail. This would not be the case, if there was not so much uncertainty. There is a lot of money spent on unsuccessful projects and the participant highlights the fact, that uncertainties must be addressed with all the stakeholders as early as possible.

Additional information on the performance domains

Since the performance domains proposed by the PMI are applicable for any field, the interviewee was missing a performance domain on technology. In IT projects, the limits of technology can change the processes, results and tools. The best processes will not work, if the software does not have the corresponding capabilities and implementing a new tool can be very difficult in big companies, as this involves many different stakeholders, from security, to procurement, to software architects. Another aspect of working in large companies is working globally, meaning that one business partner is sitting in New York, London and another one in Zurich, which makes it challenging to schedule regular meetings. So, there is a combination of the technological limitations and the human aspects of different cultures and working styles around the world.

4.2.4 Interview 4

Interviewee's background

Participant 4, a certified scrum master, is working as a senior consultant for approximately twelve years and is also responsible for staffing the teams for client's projects. This allows the participant to exert two different roles, one as a consultant, which includes a lot of project management, as well as a delivery team leader, to coach the teams. The participant started working with a Customer Relationship Management (CRM) software and discovered that the consulting role would be more interesting.

Project Management processes

The company of participant 4 is using the Jira software for managing the projects. It is a sprint and task planning tool and uses the Kanban method.

Change definition in projects

Any change that affects the budget or timeline is considered a change in IT projects. The participant states that working with the agile methodology, the scope is always changing, so only if the budget or schedule are changing, the change has to be flagged.

Stakeholder performance domain

Based on the Scrum manifesto, the individuals and interactions are to be put over processes and tools. The interviewee finds this very true, as managing the interaction with stakeholders can be hard. If there is a bad chemistry with a main stakeholder, it can have a drastic negative impact on the motivation of the whole team. Toxic behaviour of a stakeholder can make team members quit the project or even the employer altogether. One way to tackle this problem is communication with the team, so the team member who has a hard time dealing with a certain stakeholder, needs to identify early and be open about the problem. Only then the company can investigate and restaff the team, if it is still in an early phase of the project. Having a challenging stakeholder can also help to make the person grow, as different ways to interact with this stakeholder need to be found by doing personal development work.

Team performance domain

For every new project in the interviewee's company a new team is going to be created. To make this team work efficiently, the project manager needs to ensure that the right working habits are in place. The participant was recently coaching a new project manager and the project turned out to be highly successful. As it was this project manager's first project, the Scrum methodology and other methods were more strictly implemented, which the participant listed to be one of the factors of success.

Consultants work on at least two different projects, so the project manager needs to gather all team members and properly lead the team, otherwise the performance on the project will drop.

Development approach and life cycle performance domain

Even though the preferred development approach is agile in IT projects nowadays, the participant is currently working in a project where the main working method is the waterfall approach. This is due to the field of the client, as they work in the construction business, which heavily uses the predictive approach. About the project's background, it is a large IT implementation project where the client is creating a CRM and ERP solution at the same time. The planning is done in this waterfall way by the architects of the client. The interviewee started by proposing a sprint plan and quickly realized, that the client was managing the rest of the project in a predictive way, so the interviewee had to adapt the

sprint planning to match it to the fixed program schedule of the client. Now the project is done in a hybrid model of predictive and adaptive approach, where there were three phases, design, build and User Acceptance Testing (UAT). The consultants then used the sprints during these different phases. The client is aware that this model has a downside, namely that after the testing is done, it is not possible to introduce any major changes to the software.

Planning performance domain

For this domain, the previous project also serves as an example, as the fixed structure demanded that all planning was done beforehand. This meant that the consulting team spent two months on only planning, before they started to build. Instead of creating a broad plan, they over planned on tasks that were out of the initial scope of the project. This meant that money was spent on planning things in detail, which were not even implemented later on.

The participant states that it is more important to plan to see the bigger picture instead of the details. The most important questions that a project manager needs to answer are what does the client want and need? And how are we going to implement this? It is easy to get lost in the details of the solutions instead of pausing and thinking if this part, which is getting built, really is what the client needs.

Project work performance domain

Every project is different and to be able to work as a consultant, a lot of knowledge must be acquired. Learning is an essential part of this participant's consultancy company, that is why they have created their own learning platform. Consultants can log in and work through different learning paths on consultancy, project management and others. This is also how the company manages to onboard new consultants.

When working on the projects with Scrum, it is crucial to have the sprint retrospectives, where the team discusses on what went well, what did not, and what to improve for the next sprint. The interviewee does a retrospective session with the project team immediately after each session, so the team can exchange to get on the same page and has instant feedback. If the retro session is planned later on, it gets harder to set up a meeting for all members.

Delivery performance domain

Taking the construction project again as an example, the clients organizational culture made the decision making so difficult, that the initial scope was decreased by the client to avoid having to make decisions. Instead of adding requirements, the client requested to only work for the minimum viable product. Upon questioning, the interviewee says that this is highly

unusual and rarely happens and that normally the scope increases during the life cycle of the project.

As mentioned, usually the opposite happens, and the client increases the scope. Even though projects are using the agile approach, there is a cap on the budget, meaning it is not purely agile. Therefore, the scope has to be negotiated by the project manager to fit the budget. There are two ways for increasing the scope, one is where the project team is underestimating the work to be done, the other when the client wishes to add additional requirements. This is why one should include some buffer in the estimations when proposing a project plan to the client.

Measurement performance domain

Regarding the status of the project, the project manager has to make sure to inform the client regularly and to be transparent about the progress.

Reporting internally to the managers is mainly about the budget, how much money was spent and how much money is left for that project to spend on. The project is also staffed according to the budget available. It is important that the salesperson is selling the project with a good price, in accordance with the needs of the delivery team.

Uncertainty performance domain

The participant handles uncertainty with a proactive approach. If there are uncertainties, they are going to be flagged and included in the earliest sprint possible as a task like "Analyse thing X". This makes the uncertainty visible for everybody, including the client. The client then is informed on the missing information and the team can continue planning as more questions are answered. The technical implementation also brings uncertainty, as it is not always clear how the software is built and how the new system will affect the existing configuration. This uncertainty can be reduced by doing more testing.

Additional information on the performance domains

The participant did not find anything faulty with the performance domains proposed by the PMI.

4.3 Interview analysis

Half of the interviews were done face-to-face, the other half online via a Zoom call. The way on how the interviews were conducted also influences the analysis, as some analysis is already done throughout the interview itself. By asking further questions or summarizing a description given by the interviewee, the interviewer tries to understand the interviewee and analyses (Brinkmann, 2013). The semi-structured interview style is ideal for gaining more insights during the actual interview.

The result of the example collections was as expected; diverse but also contained some overlapping stories. Most of the interviewees were strongly suggesting, that working with the agile method is more beneficial for a project. In planning or other domains, the interviewees stated that planning was done, but the estimation often was far off. Looking into a more reliable way to estimate could be a topic for further analysis and research. Another topic which was mentioned more than once was the shift of culture in the organization, going from a hierarchical top-down approach to a more horizontal one.

While conducting the interviews, it was distinctive, that the project managers could not always come up with real-life examples for the different domains. It was difficult for them to think of an example quickly on the spot and they tended to give broad general answers, instead of a precise example relating to the performance domain. This is of big interest and shows, that the collection of examples can be further analysed.

Another interesting aspect of the given examples was that the story often contained several of the performance domains, showing again the complexity and interconnectedness of projects. It was rare to have examples which related only to a specific performance domain, showing a potential need for further interviews to be conducted.

5 Conclusion

In this chapter, a summary of the thesis is provided. The thesis is collecting real-life examples from senior project managers to complement the eight different performance domains proposed by the PMI.

In the first chapter, the objective and research method as well the structure of the thesis is introduced. In the second chapter, the theoretical foundation is laid, so the reader can understand the parts that follow. Chapter 3 elaborates in detail the performance domains, so they can serve as a foundation for the interview questions. In the fourth chapter, empirical evidence is taken from personal experience as well as the experience of the four interviewees. The result of the interviews is also listed in the end of that chapter.

The result of the collection are different real-life examples and the general opinion of the project managers on the different domains. Generally speaking, the interviewees found it difficult to come up with a story from a real project that relates to the corresponding performance domain. Therefore, they often drifted away from a concrete example to generalizing their thoughts on the topic. Some stories were overlapping, showing some common themes throughout the answers. Seeing this result after four interviews, it can be deduced that having interviews with more participants would increase the number of real-life examples.

5.1 Thesis process and learning

The research topic was not clear in the beginning, as the initial theme of the thesis was to collect various types of changes in IT projects and create different categories, as well as finding tools helping to deal with the changes. After the initial research, the researcher began to create their own set of categories to group the different changes. The categories were structured at random, with no clear distinction between the cause of changes or the existing tools available to help navigate the changes.

This set included nine categories which are shown in the figure below.

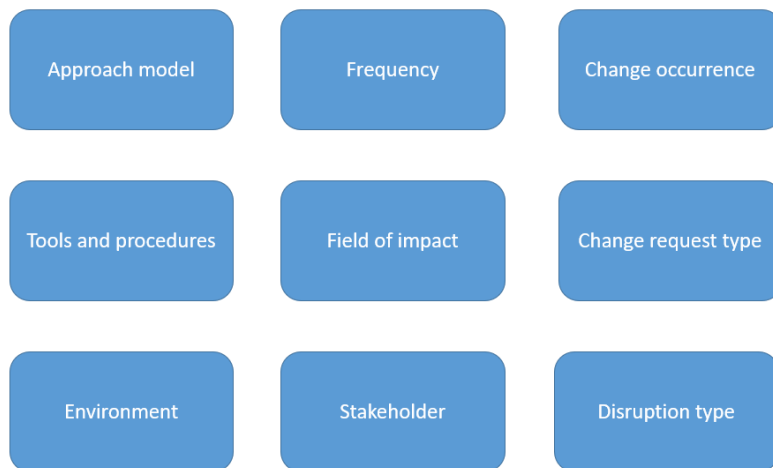


Figure 15 - Categories of changes

But it turned out that finding effective tools on handling changes, especially in these specific categories was hard, and little to no sources were found. Some of the categories did overlap with the eight project performance domains from PMI. Reasons why it was decided to discard these categories in favour of the project domains, were the difficulty to justify these particular categories as well as linking them together. Also, it was not clear whether or not this set contained the most relevant or categories with the highest impact.

Even then, the scope of the thesis was still too broad, so the researcher removed the part on proposing tools and strategies on how to handle the different changes and focused on the project performance domains and collecting examples.

Books for business students on how to write a thesis and conduct qualitative interviews helped greatly to understand the writing process, as well as reading several other old bachelors thesis published on the website <https://www.theseus.fi/>, which lists theses from different universities of applied science in Finland.

5.2 Limitations

Throughout the research, the PMI's PMBOK Guide was the main, and sometimes even the only cited work. Reading through many books, papers, and articles, most of them were based on the work of the Project Management Institute. Ideally, there would be more than one source on project management. But as far as the research of this thesis was conducted, no other institute or sources were showing other domains and/or limitations of the PMBOK Guide were found. This is another reason, why the decision led to the performance domains.

5.3 Further research

It was mentioned several times in the interviews, that all project managers were supporting an agile and/or lean approach towards project management. The future of project management is unsure, artificial intelligence (AI) can have a big impact and a study from Gartner says that by 2030, 80% of PM work is eliminated by AI (Costello, 2019). The latest PMBOK guide was published in the year 2021 with the aim to teach project managers the principles which should guide the behaviour in a way, that all the domains are mastered, despite the everchanging nature of project management. There is a gap between the interviewees' desire to be as lean and agile as possible without sacrificing the efficiency of processes.

The number of interviewees involved in this thesis is four, excluding the researcher's personal observation. Ideally, to have more real-life examples, there would be more participants, as well as the comparison between face-to-face interview and written survey. The written survey could be very beneficial for the quality of the collection, as the interviewees stated that they needed more time to think of fitting stories.

The goal of this thesis is focused on gathering real-life examples on change in project management. For the overall quality of this thesis, it would be valuable to have at least one good and bad example for each domain. The step after gathering more examples, would be to write a proposal on how to prevent mistakes or implement the learning drawn from the stories.

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Appendices

Appendix 1. Interview partner

Participant No.	Position	Years active?
1	Senior Managing Consultant	20
2	Engineering Manager	5
3	Consulting company owner	25
4	Senior Consultant	12

Appendix 2. Interview questions

No.	Question	Reason for question
1	Can you tell me a bit more about your current position?	Getting to know the interviewee and facilitating the conversation
2	How did you become a project manager?	Learning about the background of interviewee
3	How many years do you work as a PM?	Establishing seniority
4	Do you have any Project management certification (Scrum, PMP, CAPM, CSM, PRINCE2, other)?	Establishing seniority
5	Do you/your company use any PM software?	Learning about processes
6	How do you define change in projects?	Getting on the same page, aligning with theoretical part
7	<p>Give a good and/or a bad example of handling change in domain X.</p> <p>Example of questions for each domain:</p> <ol style="list-style-type: none"> 1. Stakeholder PD <ul style="list-style-type: none"> - Situation where stakeholders or their needs, values changed quickly 2. Team PD <ul style="list-style-type: none"> - Change in leadership (style) turned out for the better/worse - Change within the team culture 3. Development approach and life cycle PD <ul style="list-style-type: none"> - Situation where SDLC model changed 4. Planning PD <ul style="list-style-type: none"> - No planning, too much planning done 5. Project work PD <ul style="list-style-type: none"> - Maturity of company - Resources, Stakeholder engagement/communication 6. Delivery PD 	<p>Collecting real life examples,</p> <p>Supporting the flow of the interviews, giving examples</p>

	<ul style="list-style-type: none"> - Requirements - Scope, Scope creep <p>7. Measurement PD</p> <ul style="list-style-type: none"> - Access to project status - Decisions made on wrong measurements <p>8. Uncertainty PD</p> <ul style="list-style-type: none"> - Uncertainty led to failings project - Uncertainty turned into opportunity 	
8	Is there anything else of importance that you would like to share regarding these performance domains in project management?	Get information about the limitations of the thesis

Appendix 3. Interview presentation

