Agile Project Portfolio Management Challenges

- An Exploratory Case Study of Product Development Projects in the Automotive Industry

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Abstract

Globalization allows companies to reach a larger customer base and to focus on niche markets, driving specialization. Conversely, it also lets customers choose from a wider array of options on any given market, which all together leads to increased competition. Such global scale competition is straining profitability and urges companies to innovate both strategy and operations in search of competitive advantages. The ensuing increased rate of change has placed an emphasis on achieving flexibility to ensure alignment with market needs, with companies successful in quick modifications flourishing even in face of unpredictable and unceasing turbulence. The trend toward increasing turbulence is acutely experienced by the automotive industry. Due to the commoditization of hardware in light of digitalization, the automotive industry is undergoing a shift in profitability toward software.

The adaptation of strategy to the market is vital to survival, which in turn means that the operationalization of the strategy is crucial. One way to actualize the strategy is through project portfolio management (PPM). As corporate strategy and project portfolios are tightly connected, PPM is essential to implementing the strategy. It is of interest to study the flexible qualities of PPM in an individual industry moving from stable to turbulent, in order to gain insight into the challenges of that industry. The flexible properties of PPM in the automotive industry is thus of utmost importance to the survival of companies. The built-in flexibility of PPM is however not always enough and there is an increasing interest in agile PPM (APPM). So far, there is little advancement on the topic of APPM, and the need for further understanding is obvious with consideration to recent market developments, especially in the automotive industry.

This thesis has employed a single case study to understand what challenges traditional companies in the automotive industry face when trying to become more agile in their project portfolio management in order to align their organization around agile practices on the team level and increase responsiveness to external changes. Adopting an abductive approach, empirical data was collected using interviews, observations, documents as well as a survey. The results of this study are twofold. Firstly, an exhaustive mapping of a major automotive company’s PPM process is presented. Secondly, this mapping is utilized to establish what PPM processes could be made more agile and what the main challenges are.

**Key-words:** Project Portfolio Management, Agile, Product Development
Sammanfattning
Globalisering möjliggör för företag att utöka sin kundbas och fokusera på nischmarknader, vilket driver specialisering. Kunderna kan samtidigt välja från ett större utbud av alternativ på marknaden som leder till en ökad konkurrens. Sådan global konkurrens bidrar till en lägre lönsamhet och tvingar företag att förnya sin strategi och verksamhet, i jakt på konkurrensfördelar. Snabba förändringar kan öka kravet på att säkerställa anpassning till marknadens behov, där företag som lyckats med snabba förändringar kan prestera trots oförutsägbar och oupphörlig turbulens. Trenden mot ökad turbulens är tydligt märkbar inom bilindustrin. Allteftersom differentierbarheten för hårdvara minskar i ljuset av digitalisering, pågår en förskjutning av lönsamheten mot mjukvara inom bilindustrin.


Nyckelord: Hantering av Projektportfölj, Agil, Produktutveckling
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<td>Agile Release Train</td>
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<td>APPM</td>
<td>Agile Project Portfolio Management</td>
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<td>CD</td>
<td>Concept Development</td>
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<td>DAD</td>
<td>Disciplined Agile Delivery</td>
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<td>Decision Point</td>
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<td>WSJF</td>
<td>Weighted Shortest Job First</td>
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Foreword
This thesis was conducted during the spring of 2018 at the institution for Industrial Management at KTH Royal Institute of Technology in Stockholm, Sweden.

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First and foremost we would like to express our deepest gratitude towards our supervisors at the case company. Thank you for believing in us throughout this thesis and for giving us the freedom to explore a variety of topics within your organization. Secondly, we would like to extend our gratitude toward all the interviewees which have participated in this study. You have all contributed with valuable knowledge on the topic of PPM and we thank you deeply for your time. It has been a joy to be part of such an appreciative climate where we have been met with tremendous generosity and patience on a daily basis.

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Thank you all for your guidance and for giving us the possibility to succeed with this thesis.

Oliver Back & Emir Isakovic
Stockholm, June, 2018
1 Introduction

This chapter introduces the thesis. Firstly, the background and problematization is covered, which subsequently is narrowed down into a purpose and an associated research question. Secondly, the delimitations and limitations are presented followed by the contributions of the thesis. Lastly, the disposition of the report is outlined.

1.1 Background

The globalization of the economy is one of the major trends affecting our lives today, both as consumers in our daily lives and as professionals in the workplace. Globalization refers to the increasingly integrated and interdependent world economy, a broadly established development that is still ongoing. The global economy allows companies to reach a larger customer base and to focus on niche markets, driving specialization. Conversely, it also lets customers choose from a wider array of options on any given market, which all together leads to increased competition (Hirst et al., 2015). Such global scale competition is straining profitability and urges companies to innovate both strategy and operations in search of competitive advantages, mainly in terms of quality, cost, variation and time to market. The ensuing increased rate of change has placed an emphasis on achieving flexibility to ensure alignment with market needs, with companies successful in quick modifications flourishing even in face of unpredictable and unceasing turbulence. Without flexibility, the pressure to change will make it difficult for companies to maintain competitiveness at all (Feng & Zhang, 1998). This holds true even for the most established of companies, as evident in the fact that the average lifespan of a company on the S&P 500 has decreased from 61 to 18 years over the last 50 years (see Figure 1). The average lifespan is expected to continue dropping, implying that the rate of change is ever increasing (Foster, 2012).

![Figure 1. The average lifespan of a company on the S&P 500 (Foster, 2012).](image)

The trend toward increasing turbulence is acutely experienced by the automotive industry. Historically speaking, the automotive industry has been relatively stable with long lead times and product development cycles. Furthermore, it has gained recognition as being a leading industry in terms of incremental process improvement. The globally widespread industrialization has drained the competitive advantage out of manufacturing and as hardware is becoming more of a commodity in light of digitalization, the automotive industry is undergoing a shift in profitability toward software. Furthermore, not only is the automotive industry experiencing increased competition from the globalization, but also new market entrants that do not have a tradition as manufacturing companies, such as Tesla, Apple and Google. These entrants have backgrounds in software development and are accustomed to changing environments. This is further driving the rate of change to the degree that all
automotive companies must focus on electrification, autonomous vehicles and car-pooling to even survive in the future (Dreyer & Grønhaug, 2004; McKinsey, 2016). The emergence of such technologies is in itself unpredictable and market standards are yet to be settled, as exemplified in Figure 2. This means that companies in the automotive industry have to prepare for multiple outcomes and be ready to make changes according to external circumstances (Geels, 2012). Change is ever-present, meaning that it constantly needs to be managed in order for a company to achieve its long-term goals (Burnes, 2004). Changing conditions lead to shortened product life cycles and thus a need to constantly develop new products, meaning that product planning becomes strategically critical (Laanti, 2014; Oh et al., 2012). Markets, competitors and technologies need to be constantly monitored and the organization has to be able to respond to such changes (Abrantes & Figueiredo, 2015). In short, the automotive industry is under change and the unpredictability of its direction is causing significant uncertainty. It is therefore of importance to be flexible (Dreyer & Grønhaug, 2004) and to develop dynamic capabilities (Teece et al., 1999).

![Figure 2](image)

**Figure 2.** The volatile attention technologies receive illustrates the difficulty to predict what technologies will ultimately prevail (Geels, 2012).

The market approach and positioning of a company is a strategic decision, meaning that market changes often calls for adjustments in strategy. The adaptation of strategy to the market is vital to survival, which in turn means that the operationalization of the strategy is crucial (Venkatraman & Prescott, 1990). Unfortunately, as accentuated by Hrebiniak (2006), to formulate a strategy is easier than actualizing it. One way to actualize the strategy is through project portfolio management (PPM) (Meskendahl, 2010), generally described as the coordination of projects competing for the same resources to achieve a common set of strategic initiatives (Cooper et al., 1997). According to Cooper et al. (2000), if project management deals with doing projects right, then PPM is about doing the right projects.

As corporate strategy and project portfolios are tightly connected (Arto, 2001; Morris & Jamieson, 2005), PPM is essential to implementing the strategy (Cleland, 1999; Dietrich & Lehtonen, 2005; Grundy, 2000; Shenhar et al., 2001; Srivannaboon & Milosevic, 2006). Consequently, if the strategy is constantly readapted in response to the market, flexibility in the PPM is a requirement (Killen & Hunt, 2013). Luckily, with its theoretical foundations in financial portfolios, PPM possesses an inherent flexibility allowing for it to be regarded a dynamic capability (Teece et al., 1999) and in extension also a sustainable competitive advantage (Killen & Hunt, 2010). A positive correlation between PPM performance and business success has been found (Killen et al., 2008) and it can contribute to sustained competitive advantage even in environments characterized by turbulence (Dreyer & Grønhaug, 2004). PPM can thus improve business flexibility and adaptability to quick changes, both externally and internally (Jonas, 2010). However, different industries face different challenges (Mikkola, 2001) and contingency theory dictates that practices need to be adapted to the context (Petit, 2012). Manufacturing companies have been mentioned specifically as challenged by an increasingly dynamic environment and servitization (Killen & Hunt, 2010). As such, it is of interest to study the flexible qualities of PPM.
in an individual industry moving from stable to turbulent in order to gain insight into the challenges of that industry. The flexible properties of PPM in the automotive industry is thus of utmost importance to the survival of companies.

The built-in flexibility of PPM is however not always enough and there is an increasing interest in agile PPM (APPM). The agile values and principles were developed in 2001 to address the market driven need for agility in software development (Schwaber & Beedle, 2001). Throughout this report, the term agility is used to describe the flexibility in PPM and APPM and is not to be confused with methodologies within the area of Agile, such as Extreme programming and Scrum. The agile principles were developed for the team-level of an organization, but there have lately been attempts in both industry and in academia to adapt it to program and portfolio levels. This spread indicates the need to (1) increase flexibility in PPM to accommodate for external turbulence and (2) structurally align organizations around the agile principles. Thus, the need for transformations toward agile PPM in the automotive industry is twofold: external and internal.

1.2 Problematization

The need for flexibility to follow a changing environment is outlined above and is mainly driven by macroeconomic trends, new market actors and technological innovations. Moreover, if agile methods are employed by the teams developing the products but the higher organizational levels are rooted in a more traditional way of working, the internal chasm can create misalignment and inefficiencies. To counter this problem, organizations strive to make the rest of the processes more agile. This means that the aggregated level of portfolio management need to be reinvented to accommodate for new work practices. This is especially true in larger organizations where routines and a clear structure are vital to the facilitation of work (Stettina & Hörz, 2015).

So far, there is little advance on the topic of APPM in academia, and the need for further understanding is obvious with consideration of recent market developments, especially in the automotive industry. It has been shown that companies can become more demand-driven, respond quickly to external changes, increase flexibility and ultimately achieve business agility through the use of APPM as a way to manage the portfolio and navigate the market (Steindl, 2005). The need for APPM is thus justified.

1.3 Purpose

The purpose of this thesis is explore what the main challenges are for traditional companies in the automotive industry to become agile in their project portfolio management.

1.4 Research Questions

To fulfil the intended purpose, the following primary research question has been formulated:

**RQ:** What are the main challenges to becoming more agile in PPM for a traditional company in the automotive industry?

In order to help answer the primary research question, a secondary research question is posed:

**rq:** How does the case company perform in their PPM compared to research?
1.5 Delimitations

This thesis is delimited to the project portfolio in product development at the R&D department. It is also focused on processes and only considers other aspects of PPM when they overlap or border with the processes.

1.6 Limitations

As the conclusions of this thesis relies heavily on the qualitative data gathered from interviews, the interviewees played a significant role in affecting the final result. The availability of interviewees was therefore a limiting factor, as some potential interviewees were inaccessible throughout this thesis. Furthermore, the results of this thesis were also based on the observations performed throughout the case study, which in some way could affect the behavior of the people being observed. Therefore, observed results could be considered a source of error.

Furthermore, this thesis was obligated to follow the time requirements determined by the governing institution, which amounted to a five-month period. Hence, the scope of the thesis had to be aligned with this time requirement.

1.7 Research Contribution

Research contribution is commonly divided into academic contribution and industrial contribution. Academic contribution is in turn divided into theoretical, methodological, analytical and empirical contribution. The limitation in scope of a Master thesis makes it difficult to achieve theoretical or methodological contribution, hence the main contribution of this thesis will be analytical and empirical (Blomkvist & Hallin, 2014). The analytical contribution resides in the comparison and joining of two separate research areas into one, agile principles and project portfolio management, which currently is underexplored. The empirical contribution consists of the mapping of the PPM in an industrial company with respect to agile theory and principles. The lack of empirical data is especially prominent for the area and a systematic study can provide basis for future work.

The main industrial contribution lies in the comparison between theory and practice. Practitioners can receive insight into what is being done in the industry when it comes to agile PPM and what remains to be done. As we have an underlying assumption that the traditional companies in the automotive industry are in need of a transformation toward a more flexible state, this thesis can provoke urgency and legitimization for such an effort to be initiated. The thesis also outlines the main challenges to becoming agile in PPM, which can help practitioners with implementations.
1.8 Disposition

Chapter 1: Introduction. This chapter introduces the thesis. Firstly, the background and problematization is covered, which subsequently is narrowed down into a purpose and an associated research question. Secondly, the delimitations and limitations are presented followed by the contributions of the thesis. Lastly, the disposition of the report is outlined.

Chapter 2: Methodology. This chapter handles the methodology applied throughout this thesis. It begins with a review of the research design and data collection methods, which is followed by a review of how the empirical data has been analyzed. The chapter ends with a discussion on the validity, reliability and ethics of the thesis with respect to the methodology employed.

Chapter 3: Literature Review. This chapter provides an overview of the literature in this thesis. Initially, an introduction to the theoretical framework is provided, followed by thorough explanations in regards to PPM literature. Lastly, agile and APPM theory is outlined.

Chapter 4: Results. Chapter 4 is structured according to the analytical framework and presents the results of the empirical data collection. This includes the results from the interviews, observations, document reading and the survey. These results will then be discussed in relation to the literature review in chapter 5.

Chapter 5: Discussion. This chapter covers the discussion on the findings from the case study in relation to the literature. The PPM performance and the APPM importance and performance is discussed. Last, considerations when becoming agile are outlined.

Chapter 6: Conclusion. The final chapter concludes the report by clarifying the answers to the research questions as well as their implications to both academia and industry. Limitations and suggestions for future research is subsequently covered.
2 Methodology

This chapter handles the methodology applied throughout this thesis. It begins with a review of the research design and data collection methods, which is followed by a review of how the empirical data has been analyzed. The chapter ends with a discussion on the validity, reliability and ethics of the thesis with respect to the methodology employed.

2.1 Research Design

The research is founded in the interpretivist epistemology, focusing on stimulating rich understanding rather than explaining causal mechanisms (Karakaya, 2017). This perspective is common within the social sciences, especially as the exploration of the field in question is limited (Gomm & Davies, 2000). The thesis thus sacrifices external validity for internal validity (ibid.). Had the extant literature been further developed, a more positivistic approach could have been selected through hypothesis formulation following a literature review. Albeit, Eisenhardt (1989) provides a framework for taking on less explored research fields in a positivistic manner, but although the article has to some extent inspired the research process for this study, the framework was considered too extensive to fully accommodate for. As the aim of the thesis is not only to provide understanding, but also to contribute to the case company, the hermeneutic enquiry was discarded in favor for an address of the research question as a research strategy (Gomm & Davies, 2000). This approach is also aligned with the nature of a thesis methodology and is advantageous since it allows for a broad set of data collection methods (ibid.).

Due to the under-developed knowledge on the research area, an exploratory research approach was deemed most suited. When the problem area is vague, an exploratory approach can be used to capture all aspects of the investigated phenomenon. This helps in unraveling contextual factors that make up the setting to which the problem is contingent (Dul & Hak, 2008), as well as uncover the areas for subsequent theory development (Voss et al., 2002).

The exploratory approach of the thesis, along with the fact that we partnered with a company with the issue in mind, made a case study approach natural (Voss et al., 2002). Case studies provide in-depth, holistic views of complex situations, often needed when focusing on relationships and processes in a non-synthetic setting (Denscombe, 2010). A case study is also considered the most fitting choice when studying a contemporary but previously relatively unexplored phenomenon (ibid.). According to Yin (2014) a case study can provide a holistic view of a phenomenon, taking the complexities of interdependencies between constructs and activities into account. Meanwhile, case studies also allow the results to be anchored in a real-world context, leaving findings readily applicable for practitioners (ibid.). In-depth knowledge of the holistic reality was central to this thesis, leaving a case study the suitable choice.

Throughout the research, a single case design (Yin, 2014) was used to provide empirical evidence and in-depth understanding of the problems associated with project portfolio management. Single case designs are associated with exploratory purposes, as it allows for in-depth understanding of the studied phenomenon. Moreover, while multiple case designs offer greater generalizability, this was not considered an option as the underlying field of agile portfolio management is not yet sufficiently understood to draw broadly applicable conclusions. As such, the deep understanding provided by single case designs was prioritized over generalizability (Voss et al., 2002).
A typical case was chosen in an attempt to increase representativeness and generalizability (Denscombe, 2010; Karakaya, 2017), in spite of the interpretivist approach. The need for this study was suggested by our case company, where there existed a need to analyze an industry-wide problem that was crucial for the company’s strategic development, also called an opportunistic study (Collis & Hussey, 2014). The case company was representative of the traditional actors in the hardware oriented automotive industry and it therefore became interesting to study how the PPM approach was constructed and whether APPM was being utilized to follow the development of the increasingly turbulent automotive industry.

The possibilities for multiplicity in data collection methods for case studies are unrivaled by other research design, and the successive data triangulation forms strong empirical evidence to derive confident conclusions from (Denscombe, 2010; Yin, 2014). Triangulation strengthens the validity of the results and raises the quality of the findings (Denscombe, 2010; Collis & Hussey, 2014; Yin, 2014). Case studies have high validity with practitioners and pave the way for theory development, since it is a research design without the austere constraints of formal questionnaires and models (Voss et al., 2002).

This thesis employs interviews, observations, documents and a survey to collect and triangulate empirical data. All data, including theoretical data from literature, was considered when converging toward conclusions. Yin (2014) calls this “converging lines of inquiry” and explains that it results in more credible conclusions. The collection of data was mainly qualitative, which is pertinent to studies of relatively unexplored area and allows for flexibility and rich understanding (Denscombe, 2010). Due to qualitative composition, we chose to include a pre-study to gain understanding about the background and context of the studied phenomenon. Collis and Hussey (2014) refers to this as “contextualization” and it is an important step in understanding complex situations.

According to Collis and Hussey (2014), it is difficult to provide a clear distinction between collection and analysis of data in qualitative studies. The abductive approach builds on the iterative alternation between empiricism and theory, allowing insights from one side affect the choice of the other. It reveals latent patterns and emphasizes understanding more than other approaches, making it highly suitable for case studies (Alvesson & Sköldberg, 2017).

As one can observe in Figure 3 below, the research design was comprised of two phases. The division into two phases allowed us to first focus on breadth and divergent data collection, before shifting focus to depth in order to converge toward our subsequent conclusions. Essentially, the second phase answered the research question, while the first phase ensured we answered the right question, in the right way.

Both phases followed an abductive research approach where the objective was to allow for the possibility of revising the chosen data collection methods and allowing for the empirical evidence to be revisited and be seen in a new manner (Neuman, 2006). According to Blomkvist and Hallin (2015), an abductive course of action will regulate the selection of literature. Therefore, we found the abductive approach to be suitable when attempting to determine as well as summarize relevant literature within both research phases. In the pre-study phase, the abductive approach facilitated understanding of the research area and formulating the research problem. The accumulated understanding from the pre-study was thus used to plan and construct the main study phase. Similar to the pre-study phase, the main study phase carried out iteratively where empirical data was cross referenced with literature and vice versa.
The objective was to come upon relevant theories which could be utilized to answer the research question and to verify the relevance of the findings.

Figure 3 illustrates the research design utilized in this thesis. Activities have been categorized according to color, and their interrelationship can be observed in the figure. Data collection activities are represented with blue color, analytical activities with orange color and miscellaneous activities with green color. The construction of mentioned research design will be thoroughly motivated throughout the subsequent sections.

2.1.1 Pre-study

The primary objective with the pre-study phase was to identify the problem as well as gain an initial understanding of the area from the preliminary literature review. These entities would then serve as a starting point for the following main study.

The pre-study was conducted in an abductive manner in order to iteratively converge toward a more defined problem area. This approach allowed for alternation between theory and empiricism, which was critical when we attempted to formulate a research question to satisfy both academia and practitioners. In practice, this meant studying the literature while also performing interviews, studying case company internal documents and conducting observations in parallel. The data collection in this phase had a broad focus to ensure that relevant facets of the problem area were not excluded. This meant including theory from PPM as well as maintaining an open mind towards including other theories that could be valuable for the subsequent research process.

The interviews were conducted with the managers involved with the PPM processes and with people close to these managers. This included people who were involved with the decision-making process, as well as project managers and controllers who undertook the project after it had been cleared for execution. In order to understand the dynamics of the case company’s PPM, we attempted to lay out
the underlying processes and study the attitudes toward APPM. The portfolio processes were at the moment being transformed in a way that would allow for increased agility in the case company's portfolio management. Therefore, it was of interest to investigate why the initiative was started and what underlying problems existed for such an initiative. Needless to say, the empirical evidence was a major contributor to the specification of the research question.

The data collected and issues identified were cross referenced with our assigned supervisors both at the case company and at KTH to ensure relevance to the overall thesis project, before going into the main study to address the issues.

2.1.2 Main Study
After the pre-study was completed, two outcomes were retained: the problem area was defined and a literature summary was outlined. The collected empiricism made it obvious that the problem area ought to include a combination between PPM and APPM literature and not solely focus on PPM theories, which was the original intention. This revelation, along with the emerging analytical themes, created the prerequisites for the main study. The problem area thus represents what to study, while the themes identifies how that problem area was to be studied. Consequently, it was thereby possible to construct the conditions for the interviews, observations and the survey which were all used throughout the main study. The two aforementioned outcomes assisted in the creation of the interview guide for the second round of interviews, the choice of relevant observations and the design of questions in the survey.

The abductive approach carried out in the main study allowed us to iteratively converge deeper toward our subsequent findings and continuously validate, as well as revise, our data collection to ensure the efforts were focused in the right direction. In practice, this meant alternating between literature, interviews, observations and reading documents. Only the survey was left out, which was carried out after the completion of the abductive data collection. The intention with this was to accumulate as much knowledge within the problem area as possible, before constructing a survey where the empirical findings could be concretized, assessed and compared with knowledge acquired from literature and interviews.

As mentioned, we let our empirical findings guide our choice of literature, which in turn helped us probe relevant areas during the empirical data collection. This iterative process culminated in an analytical framework, which was used to structure an analysis on the different facets of PPM. It was designed to distinguish different themes, both in theory and in practice, in an attempt to cover all the important aspects of PPM. This analytical framework is presented in section 4.1 and it provides a structure for the empirical results and the ensuing analysis in this report.

2.2 Data Collection Methods
This section outlines the different data collection methods that have been chosen for this thesis. Initially, the approach to the literature review is detailed. This is followed by explanations regarding interviews, observations, documents and the survey.

2.2.1 Literature Review
The literature review for this thesis was conducted in two phases. The pre-study phase served as a way to reach a general understanding about concepts which were studied throughout this thesis, focusing on breath and contextualization (Collis & Hussey, 2014). In the subsequent main study phase, the focus shifted to depth and answering the research questions. The abductive approach allowed empirical
findings to help guide the search for relevant literature as new search words could be added in response to new insights. Aside from finding literature through search words, it was also found by following the citations of articles we found relevant. Since this can create a lock-in within a narrow literature stream, we made sure to add new search words throughout the literature study.

The generation of search words (found in Appendix A) was based on the topics related to Agile Project Portfolio Management. Key search words were: agile, agile portfolio management, portfolio management, multi-project management and product development portfolio. The databases used in this thesis are KTHB’s Primo and Google scholar. Primo and Scholar were selected primarily for three reasons. First, the sources are highly available and gratuitous. Secondly, the wide reach of the databases ensured satisfactory breadth of the theoretical foundation. Thirdly, the inclusion of grey literature (particularly in Scholar) allowed for a wider perspective to the problem area which proved important as the peer reviewed research was scarce for Agile Project Portfolio Management (Harzing & van der Wal, 2008).

All the articles found during the search with titles deemed relevant to this thesis were added to a reading list. The searches were done successively as new knowledge needs arose as a result from deeper understanding of the research area. Upon completion of a search, the articles were ranked after reading the abstract as well as other parts of the articles needed to judge their relevance. The ranking ranged from A to D and articles ranked A were believed to be most relevant whereas articles ranked D were believed to be of least relevance. When all the articles had been ranked, they were studied in order of relevance, starting with the most relevant ones. The articles were read, summarized and coded based on themes relevant to this thesis. This proceeded until the knowledge within a certain area was saturated and the marginal benefit was found lower than that of other activities. The publication year of each article was also noted and more recent articles (primarily those published no more than five years ago) were given greater emphasis in the body of theory used in this thesis.

2.2.2 Interviews
Due to the interpretivist approach, interviews were central in gaining a deeper understanding of the case company. Semi-structured interviews were conducted in the two different phases of this thesis, in order to gather empirical evidence. This approach was chosen since the objective was to collect soft data in a structured manner (Lundahl & Skärvad, 2016). According to Lundahl and Skärvad (ibid.), soft data includes aspects such as people’s judgement of a situation, the preconceptions and motives that lie behind a specific action as well as the collaborative climate in an organization.

Interviews allows for unexpected discoveries and it also serves as good means when attempting to determine the research question (Blomkvist & Hallin, 2014). The data collection method is best used in order to understand complex environments and relationships and when information sought after is not widely accessible. It also offers relatively high validity as data can be controlled for both accuracy and relevance in conjunction with its presentation (Denscombe, 2010).

All interviews were conducted in person in meeting rooms that were close to the interviewees, in the offices of the case company. Furthermore, all interviewees have been coded in order to allow for easy reference, as well as appropriate secrecy (see Table 1). Moreover, all interviews were audio recorded with consent from interviewees, in order to help the subsequent analysis, since it offers a permanent record. To counter the downside that only audio is captured, we took photos of any drawings that were made during the interviews to secure as much data as possible (Denscombe, 2010).
The interviews were conducted in two rounds, with different purposes. The first round of interviews was held during the pre-study phase to identify the broad issues experienced by the interviewees. For this, we used open-ended questions in semi-structured interviews with a broad focus. This approach was chosen to get extensive answers with the possibility to ask follow-up questions, but still to be able to limit the answers to the beforehand chosen relevant topics (Denscombe, 2010).

The interviewees in the first round during the pre-study were chosen after consultation with the case company contact person. A non-probability sampling technique was thus used since we received indication on which interviewees were of interest (Denscombe, 2010). Without this gateway, it would most likely not be possible to get in contact with relevant interviewees, which unfortunately is detrimental to the replicability of the thesis. They were selected on the basis that they work closely with the internal PPM and can thus be considered the most reliable source of information on the PPM processes at the case company. Denscombe (2010) refers to this as purposive sampling and it is commonly used to extract knowledge from interviewees distinguished as knowledgeable on the studied area.

As this thesis has a strong focus on PPM, it was relevant to interview people with positions on a higher level in the company. Therefore, we interacted with a variety of PPM process managers which we interviewed in order to identify and answer our research question. The interviews that were carried out are depicted in Table 1 below.

<table>
<thead>
<tr>
<th>Interview</th>
<th>Position</th>
<th># Interviews</th>
<th>Length (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Project Manager</td>
<td>1</td>
<td>30</td>
</tr>
<tr>
<td>B</td>
<td>Technical Project Manager</td>
<td>2</td>
<td>45, 60</td>
</tr>
<tr>
<td>C</td>
<td>Senior Agile Coach</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>D</td>
<td>Project Manager</td>
<td>2</td>
<td>60, 45</td>
</tr>
<tr>
<td>E</td>
<td>Head of Process Support</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>F</td>
<td>Head of Portfolio Controlling and Business support</td>
<td>1</td>
<td>30</td>
</tr>
<tr>
<td>G</td>
<td>Assignment leader</td>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>H</td>
<td>Scrum Master</td>
<td>1</td>
<td>30</td>
</tr>
<tr>
<td>I</td>
<td>Head of section</td>
<td>1</td>
<td>30</td>
</tr>
<tr>
<td>J</td>
<td>Technical project manager</td>
<td>2</td>
<td>60, 60</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>10 unique</strong></td>
<td><strong>13</strong></td>
<td><strong>565</strong></td>
</tr>
</tbody>
</table>

*Table 1. Interviews conducted for this thesis.*

The second round of interviews during the main study had a narrower focus on answering the research question than the first. While still relying on semi-structured interviews, the topics had grown more precise and we made sure to keep to the interview guide more closely. Some of the most knowledgeable
interviewees of the first round were interviewed again in the second round to help answer the research question. During the interviews of the first round, recommendations on further relevant people to interview came up and were followed upon during the second round. This is known as snowball sampling and is appropriate when searching for new and deepened knowledge (Denscombe, 2010), suitable for the abductive and interpretivistic approach. As these recommended people were of a higher seniority with less time for interviews, we chose to place these interviews in the second round where they could help in answering the research question.

2.2.3 Observations

During the course of the data collection we were situated in the offices of the case company, where we received access to internal tools and platforms such as PCs and intranet. This allowed for us to be embedded in the organization and make observations on the daily routines of the employees at case company. Although sitting in a technical department, working on the software systems, contact with relevant people was conducted through internal email addresses and security access cards.

Direct observations were made to gain understanding of how the processes and routines work, in an unbiased and unfiltered manner not achievable through interviews. Through observations we could witness what actually happens, instead of relying on the accounts of interviewees. According to Lundahl and Skärvad (2016), the observer should strive for hidden observation without interaction (see Figure 4). The reason for this is that the behavior being studied can then be assumed to be natural and normal behavior. Due to the necessity to be physically present in the different meetings depicted in Table 2, it was not possible to conduct the observations from a hidden standpoint. However, all attended meetings were observed without any interaction, thus placing this study in the lower left of the matrix presented in Figure 4 below.

![Figure 4. Different types of direct observation (Lundahl & Skärvad, 2016).](image)

We utilized participant observations, which are suitable when aiming to understand processes and situations in order to generate qualitative data (Denscombe, 2010). For the purposes of this study, this translates into meeting participation. The meetings were chosen based on their relevance to the processes and functions related to PPM. According to Denscombe (ibid.), observations can provide holistic insights without interfering with the data source.

The observations (Table 2) were conducted continuously throughout the thesis and were not clearly separated into the two phases as the literature review and the interviews. This continuous approach was
chosen mainly because we could not decide on when to participate in the meetings, but instead had to follow the planning of the case company. We participated in meetings related to PPM to be able to both generate a greater understanding of how PPM is conducted at the case company, confirm or reject information from other sources and subsequently to answer the research question. Due to the fact that we were two participants, we could filter out our personal biases and misunderstandings to collectively reach a more objective consensus on what happened during the observations.

<table>
<thead>
<tr>
<th>Observation</th>
<th>Meeting</th>
<th>Participants</th>
<th>Length</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>O1</td>
<td>Scrum health check</td>
<td>Scrum masters from software department</td>
<td>45 min</td>
<td>2018-01-24</td>
</tr>
<tr>
<td>O2</td>
<td>Main “pulse” meeting</td>
<td>Project and department manages</td>
<td>60 min</td>
<td>2018-02-05</td>
</tr>
<tr>
<td>O3</td>
<td>Section head and group meeting</td>
<td>Section head and group members</td>
<td>45 min</td>
<td>2018-03-20</td>
</tr>
</tbody>
</table>

Table 2. Conducted observations which have resulted in the meeting structure presented in Communication & Decision-making in chapter 5 Results.

2.2.4 Documents
Documents are written sources of data and the type exclusively used here was visual, that is pictures and artefacts (Denscombe, 2010). As aforementioned, during the data collection we were located at the offices of the case company and had access to their intranet, although some of the pages were blocked for us as external researchers. On the intranet, some processes and activities relevant to this thesis were described and therefore used as a source of data for the mapping of the PPM. Online sources of data are highly convenient, ample information is available instantly and for free, making it an appropriate complement to people (ibid.). These points of data were also used to triangulate with the data produced by interviews and observations.

2.2.5 Survey
According to Denscombe (2010), surveys can be utilized to create a snapshot of how things are at a specific point in time, which is one of the main objectives with this thesis. Furthermore, Denscombe (ibid.) argues that surveys can be used to their full advantage when the information sought after is well defined. In order to define the information needed, we chose to conduct the survey when the second round of interviews were finalized. As surveys are less effective when performing in-depth research (Denscombe, 2010), it is significantly more beneficial to adhere to the research design proposed and simply assess the in-depth data acquired from the interviews by the means of a mixed quantitative and qualitative survey.

As described in the purpose section in this report, one of the main objectives with this thesis is to provide a comprehensive mapping of the case company’s PPM practices. In order to achieve this while at the same time increasing the validity of this report through triangulation, we chose to utilize a descriptive survey of both quantitative and qualitative nature. According to Lundahl and Skärvad (2016), the descriptive survey, unlike the analytical survey, intends to describe a phenomenon instead of analyzing it.
As time was an urgent matter during this thesis, we chose to conduct an internet thesis. This allowed us to minimize associated costs, as well as reducing the time from which we distributed the survey until the time where we received the raw data in return. This data also arrived in a format which made the process of analysis significantly simplified (Denscombe, 2010).

The survey was thereafter distributed mainly to the same people which had already been interviewed, either in the pre-study phase or the main study phase. As the aim with a survey is to maximize response rates (Denscombe, 2010), we found this to be an appropriate approach. We also distributed the survey to additional people that were unavailable for interviews and associated with the interviewees at their respective departments in order to acquire a more complete view of the case company’s PPM approach. As we knew the majority of the interviewees, we chose to send out reminders to complete the survey once every week during a three-week time span. All in all, this led to us to a sample selection which according to Denscombe (ibid.) can be described as exploratory. Denscombe (ibid.) describes this approach as being beneficial when attempting to gain insights in small-scale research where the topics of interest have not been comprehensively explored.

When selecting the survey sample, a non-probability approach was chosen. This was considered a valid choice as we believed the empirical data from the survey would not be sufficient to choose a probability approach, which according to Denscombe (ibid.) is a common reason when choosing the non-probability approach. Denscombe (ibid.) adds to this by arguing that it also might be difficult to contact a sample which has been selected through the method of probability. As we wanted to keep response rates high, we tried not to diverge from the core group of interviewees and the non-probability approach therefore seemed as a reasonable way forward. As a part of the non-probability approach, we chose to undertake convenience and purposive sampling techniques, as depicted by Denscombe (ibid.). The former meaning that we first and foremost delimited the sample to include people who we thought would have valuable data or knowledge on the topic of PPM and APPM, and the latter meaning that we delimited the sample to include people who we assumed would be reachable.

As the main study phase had provided generous amounts of information on PPM theory and the PPM processes at the case company, the survey took a more holistic perspective. The survey focused instead on the attitudes towards the PPM at the case company, to offer comparison for our own assessments from the interviews, especially on the relative importance and proficiency of the processes related to the analytical themes.

The survey consisted of five parts. The first part simply introduced and described the survey, to facilitate correct responses, and the second part consisted of administrative questions. In the third part, the respondent’s subjective view on the effectiveness and importance of PPM was probed and the fourth part asked the respondents to rank the analytical themes according to different characteristics. The fifth and concluding part of the survey was designed as a “catch-all” and asked about their general opinions and views on the PPM in the context of a dynamic business environment (see Appendix D for survey questions). The whole survey was built using a free online tool and distributed via link and email to the intended respondents after testing the survey on our supervisor and improving it after feedback.

2.3 Analysis of Empirical Data

The analysis of the empirical data followed the framework provided by Denscombe (2010). According to Denscombe (ibid.), the grounded theory approach could be used when analyzing interview transcripts where the objective is to identify concepts and theory which lies within the empirical
evidence. Denscombe (ibid.) mentions that by nature the grounded theory approach is inductive, as it attempts to utilize findings from specific empiricism to create theory which can be generalized.

The analysis followed the subsequent steps as recommended by Denscombe (ibid.) and which state that the researcher should commence the empirical analysis by exploring the data. The steps in Denscombe’s (ibid.) grounded theory approach can be seen in Figure 5 below. Initially, the researcher should have a superficial view on the collected data in order to be reminded that of the scope of the thesis. By re-reading the data, themes will eventually emerge. Furthermore, Denscombe (ibid.) argues that memos should be created by the author as new insights are reached. This was done in practice by writing short summaries and comments besides the interview transcript which at a later stage in the research process served as reminders of how the thought process looked like at the time and which interpretations had been made.

Next, the codification of the data was conducted. Empirical data was associated with codes derived from the literature findings. These codes were then linked to categories and hence categorized. When all codes had been categorized, it was possible to reduce the number of codes and categories by merging similar codes and categories. Additionally, these codes and categories where subject to a hierarchy structure, where low-level codes and categories were subordinated to higher-level codes and categories. Lastly, an iterative process was undertaken where emerging codes and categories were cross referenced with the empirical data. The ultimate findings were used to identify key concepts which subsequently led to the theoretical contribution.

![Figure 5. The grounded theory approach to the analysis of qualitative data (Denscombe, 2010).](image)

To further assess the theory emerging from the interviews and the observations, a survey was constructed so that nominal and ordinal data could be collected. Stevens (1946) depicts nominal data as being countable and allows for categorizing. This data type is typically unambiguous and does not allow for extensive statistical manipulation (Denscombe, 2010). The ordinal data aspect of the survey was included in such a way that the respondents could assess different statements using ranking or a Likert scale. Furthermore, qualitative questions were included within the survey, which were analyzed in accordance with the grounded theory approach depicted above.

When the quantitative data has been collected, the next step was to codify and group the data (Denscombe, 2010). According to Denscombe (2010), there are instances where the raw data occurs naturally in the form of numbers. This is true for this thesis, as the only relevant data was collected from the values distributed on the rankings and the Likert scales. Furthermore, when the data was codified, it was grouped and sorted in an array to prepare it for analysis. This was done by sorting the data in
accordance with the mean values provided from the qualitative questions in order to more easily interpret the main emerging themes.

When the data is presented in an interpretable way, it is time to investigate whether there are significant patterns and relationships that can be observed (Denscombe, 2010). As some questions in the questionnaire were formulated to act as counterparts to other questions, it was possible to observe a pattern across different categories of questions.

2.4 Methodology Discussion
This section critically discusses the choice of methodology to evaluate the trustworthiness of the results of this thesis.

Challenges appear during a transformation. Therefore, a longitudinal study would have been preferable as the case company is undergoing a shift toward agile methodologies, but lack of time rendered it impossible. Under ideal conditions it would have been preferable to study a case before, during and after a transformation to be able to confidently answer the research questions.

2.4.1 Validity and Reliability
Validity judges how well data collection is measuring the intended variables, which for this thesis translates into how well the empirical data answers the research questions. There is no way of guaranteeing the validity of the data, but measures can be taken to increase it. Through the use of triangulation, the cross-referencing between different data sources, validity can be increased with the underlying logic that if several data sources point in the same direction, the likelihood that they are correct is increased (Denscombe, 2010; Voss et al., 2002). To ensure this, we used observations, a survey and two rounds of interviews with several different respondents confirming data across participants, allowing us to evaluate whether the data collected coincided. Moreover, according to Eisenhardt (1989), being two researchers allow for multiplicity in interpretations, rendering convergence toward a faulty conclusion less likely. This results in both richer data and increased confidence in the conclusions posed.

Reliability is the repeatability of the conducted research, meaning that it should be possible to reproduce the results of study by using the same methodology. In qualitative studies, the personal involvement of the researcher inevitably affects the data collection and the interpretations of the data, which in turn influences the direction of the research, especially in iterative, abductive studies (Denscombe, 2010). This thesis is built mainly on qualitative data collection methods, which means that the data will depend on who the participants are and what questions they are asked. In this regard, the reliability of this thesis is quite low, especially since semi-structured interviews were used, but some measures have been taken to increase it. By appending the interview guides we have used to this thesis, these can be adopted by other studies in order to mimic the interviewing process. Also, by reporting what company roles the participants have it is possible to conduct interviews with analogous people. This holds true as well for the observations and the survey, by specifying the approaches in terms of meetings attended and questions asked it is feasible to repeat the methodology, although it is not possible in any way to ensure the same data to surface.

2.4.2 Generalizability
Generalizability, also known as external validity or transferability, refers to how well the findings of this thesis are applicable to other examples of the same phenomenon. Research anchored in
interpretivism are less generalizable, since focus lies on in-depth understanding rather than broad applicability. This is expressed through the fact that qualitative studies usually employ a small number of case studies (Denscombe, 2010). As it comes down to a choice between deep understanding and broad explanations, a decision must be made. For this thesis, the decision was made to generate deep understanding for one case. One case can never be regarded as statistically (or otherwise) generalizable, so neither can the results from this thesis. However, it is possible to achieve analytical generalizability where the goal is to expand on current theories instead of attempting to represent a sample (Yin, 2014).

As our analysis is based on the mapping of processes at the case company, the generalizability of the conclusions only extends as far as the generalizability of the mapping, which is not very far. On the other hand, we attempted to choose a typical case (Karakaya, 2017) in order to draw some broader conclusions. This thesis attempted to investigate whether there was any need in the first place to empirically study APPM challenges, since no such studies had previously been conducted. The results should therefore not be seen as a widely applicable truth, but rather as an indication of the relationship between the ongoing transformation in industry and the shift toward agile in the PPM research. APPM is in itself relatively unexplored, so the lack of knowledge in the area suggests that the need for further research is generalizable across industries.

### 2.4.3 Ethics

Ethical issues are always to be considered during an academic investigation. To avoid ethical violations and harm, we took several measures. All participants were informed that taking part was entirely voluntary and that no coercion was exercised to attain answers to the posed questions. No compensation other than the results of the study was offered for the participation in the research, as that could have resulted in biased results, and the commitment in terms of time and effort were stipulated beforehand. We also tried to be as clear as possible in communicating the purpose of the thesis to allow for informed decisions regarding participation. Furthermore, full anonymity and confidentiality was adopted to encourage honest answers and confidence. Neither the names of the participants nor the case company are mentioned to avoid leakage of sensitive information (Collis & Hussey, 2014; Denscombe, 2010). We remained within the boundaries of the law and we both signed non-disclosure agreements and code of conducts at the case company, while staying as open as possible about our intents with the study (Denscombe, 2010).

### 2.5 Distinction between PPM and APPM

Throughout this thesis, PPM and APPM are discussed as separate concepts. Traditional PPM is denoted as Legacy PPM to clarify this distinction, when discussing practices not introduced from the agile methodologies. In practice, companies employ one PPM, that however can exhibit varying degrees of agility. APPM is one of all ways to conduct PPM and is as such a subset of PPM, but it has been extracted in this thesis to highlight the differences in characteristics between high and low degrees of agility in PPM. This has allowed us to explore the performance of the PPM and APPM at the case company, by taking on different perspectives on the same PPM and not by investigating two different set of PPM processes. Thus, we are taking on an internal standpoint on the processes as the unit of analysis, discussing the way in which the PPM is conducted.
3 Literature Review

This chapter provides an overview of the literature in this thesis. Initially, an introduction to the theoretical framework is provided, followed by thorough explanations in regards to PPM literature. Lastly, agile and APPM theory is outlined.

3.1 Theoretical Framework

The theoretical framework helped guide the literature study. It was developed iteratively through the abductive approach of the thesis and consists of three parts (see Figure 6). First, PPM constitutes one part of the theoretical framework. There is ample research on the topic, taking departure in the works of Cooper et al. (1999, 2000, 2001). Second, literature on agile was studied. The agile philosophy originates in software development but includes methodologies and principles that can be applied to PPM. Third and last, the limited research on the intersection between PPM and agile, denoted as agile project portfolio management, was reviewed. All in all, this covered the theory needed to answer the research questions.

![Diagram of PPM, APPM, and Agile]

Figure 6. The theoretical framework used to cover necessary theory for this thesis.

3.2 Legacy Project Portfolio Management

There exists a variety of definitions that includes distinct factors of importance when it comes to PPM. A commonly cited definition was introduced by Levine (2005, p.70):

“PPM is a set of processes, supported by people and tools, to guide the enterprise in selecting the right projects and the right number of projects, and maintaining a portfolio of projects that will maximize the enterprise’s strategic goals, efficient use of resources, stakeholder satisfaction, and the bottom line.”

This is the definition adopted for this thesis and has guided our fundamental understanding of PPM.

Project portfolio management has its origins in the financial sector, where risk and return of assets were weighed against each other in order to create a portfolio optimizing the collective return of the investments (Markowitz, 1991). The concept has since long been applied in multi-project management (Gibson & Nolan, 1974) and although it early centered around the risk and return trade-off (Blichfeldt & Eskerod, 2008), it soon developed into a broader set of tools and processes to deal with the ranging issues that appeared as complexity increased in project portfolios.
Reaching High Level Objectives

PPM is today something more than just tools and processes. It is about the organizational transition from being solely project oriented to being aware of higher level objectives (Levine, 2005). Many organizations have attempted to utilize PPM to facilitate the process of managing projects in order to reach firm specific goals (PMI, 2008). It has been established that formal project management processes are a prerequisite for successful PPM implementations (Brown & Eisenhardt, 1995; Dietrich, 2006; Martinsuo & Lehtonen, 2007; Teller et al., 2012). According to Cooper et al. (2001), the most important objectives to accomplish are maximizing the portfolio’s financial value, strategically aligning the portfolio and balancing the portfolio. A variety of additional factors have been considered by different authors and the ambition with the subsequent paragraphs and subsections is to guide the reader through the important facets of PPM. Lastly, given the background of this thesis, the themes are evaluated on the extent of flexibility they exhibit. Consequently, it is possible to assess which challenges lie ahead and how organizations can utilize their PPM to become more responsive to external dynamics. By doing this, organizations can achieve a level of resource flexibility which enables strategic alignment and the coordination of collaboration efforts in a way that allows the organization to reach its objectives (ibid.).

PPM Goals

Cooper et al. (1997, 2000) states that the most common goals for organizations utilizing PPM are: value maximization, portfolio balance and strategic alignment. Cooper et al. (2001) builds on these three themes but also emphasizes the importance of having a systematic approach of making go/kill decisions, as well as focusing on appropriate high value projects available. Cooper et al. (ibid.) adds to this insight by emphasizing the importance of having the right number of active projects.

One of the most important factors of PPM brought forward by Cooper et al. (ibid.) is to maximize the value of the portfolio (see also Killen & Hunt, 2013; Levine, 2005; Meskendahl, 2010; Pennypacker & Dye, 2002) and given the background presented in this thesis, the goal is to assess the current PPM approach conducted by the case company by factoring in the dynamics of the external environment, in order to maximize the long-term value of the portfolio. Traditionally, the focus of value maximization has implied the financial or business value and managers have been prone to prioritize such value over market and technology value. More recently a wider, more long-term perspective on value has been adopted in the literature, factoring in concept such as ecology, social issues, health and safety, societal influence as well as learning and knowledge development. Such strategic values are not reaped immediately, often intangible and are difficult to express in financial terms (Sanchez & Robert, 2010). The effect of these so-called non-commercial values on traditional financial and commercial value may be crucial in the short term. Despite this, measures of non-commercial value should be included in frameworks for project portfolio success (Martinsuo & Killen, 2014). This may also influence the perspective on project portfolio management as a political process of negotiation and bargaining (see Martinsuo, 2013; Christiansen & Varnes, 2008) as it is mainly concerned with formal measures and frameworks (Martinsuo & Killen, 2014). Stakeholder management has consequently been found to be crucial to successful PPM (Aaltonen, 2011; Assudani & Kloppenborg, 2010; Beringer et al., 2013). A recent study (Patanakul et al., 2012) highlights the importance of post-Cooper values in its pursuit after a definition of PPM effectiveness by including “[the management of] projects in the portfolio to promote transparency, process consistency, visibility and predictability of projects in the portfolio, and to promote integrity, cohesion, and morale of the project management community.”

Scholars commonly construct their own measures of project portfolio success, but most are based on the goals for PPM provided by Cooper et al. (2001). While they studied correlations between portfolio methods and portfolio success, others have expanded on the model by including moderating factors.
Management quality, consisting of information quality, allocation quality and cooperation quality, has been shown to have significant effect on portfolio success. These qualities are seen as the result of the methods used and focus on the condition of, rather than actions within, PPM (Jonas et al., 2013).

**Managing Uncertainty**

Management of uncertainty and change has been identified as a main role in PPM (Petit, 2012; Petit & Hobbs, 2010) and adaptive capabilities have been shown to impact PPM performance positively (Biedenbach & Müller, 2012). Therefore, the degree of flexibility needs to be assessed for each of the PPM aspects to accommodate for external uncertainty. It is our intention to assess the case company’s competitiveness by looking at their PPM flexibility. According to Lau (1996), flexibility is the most important factor when trying to achieve competitive advantage, and Dreyer and Grønhaug (2004) have created a framework which states that in order for companies to adapt to a dynamic environment and perform well, uncertainty factors need to be mapped to different types of flexibility. Killen and Hunt (2010, 2013) as well as Petit (2012) add to this statement by arguing that PPM is a dynamic capability helping organizations to respond to changes in the external environment. Furthermore, Petit (ibid.) brings forward the challenges that PPM faces in dynamic environments, such as continuous planning, resource re-allocation and managing new projects that populate the portfolio.

**3.2.1 Formalization**

The degree of formalization refers to how explicitly processes, activities and methods regarding PPM are defined within an organization. Seen as the first step when introducing PPM (Cooper et al., 2001), formalization is tightly coupled with the PPM capability (Archer & Ghasemzadeh, 1999; Cooper et al., 2001; Miguel, 2008). Its importance for PPM performance has been highlighted (Cooper et al., 1999, 2001; Dietrich & Lehtonen, 2005; Martinsuo & Lehtonen, 2007), as businesses performing better at PPM have more formalized processes (Cooper et al., 1999, 2001). These businesses have distinct procedures to accomplish activities pertaining to PPM, such as resource allocation, selection and prioritization (Cooper et al., 1999) and formalization is therefore a recommended approach (Fricke et al., 2000; Patanakul & Milosevic, 2009). Management buy-in (Cooper et al., 1999) and the uniform application is also stressed (Archer & Ghasemzadeh, 1999; Cooper et al., 1999, 2001; Coulon et al., 2009).

In project-based environments, formalization can occur both at project and portfolio level. Managing a portfolio can prove a challenge despite project formalization (Ahlemann et al., 2009) and the complexity of the portfolio has an impact on this (Söderlund, 2004). If both levels are formalized, the contribution to portfolio success is more than additive, especially in complex portfolios (Teller et al., 2012).

To avoid biases and unwanted power dynamics in the decision-making process, the evaluation should be done based on objective criteria and by teams rather than individuals (Levine, 2005; Müller et al., 2008). There is no universal structure for portfolio formalization (Killen et al., 2008; Teller et al., 2012), instead the structuring has to be contingent to each portfolio to be successful (Teller et al., 2012) but some factors can be distinguished in the literature. Facets of formalized PPM could include relevant and correct data, evaluation criteria that are objective and unequivocal, definitive and reasonable guidelines and wide-spread processes (Archer & Ghasemzadeh, 1999; Blichfeldt & Eskerod, 2008; Cooper et al., 1999, 2000; Fricke et al., 2000; Martinsuo & Lehtonen, 2007; Patanakul & Milosevic, 2009; Payne, 1995).

To conduct the activities related to PPM, a project portfolio management office (PPMO) is suggested for the sake of centralization, standardization and coordination (Killen & Hunt, 2013). PPMOs are a
subset of project management offices that deals with the management of the portfolio. Three roles of the PPMO has been identified as coordinating, controlling and supporting, where two of the roles have been shown to positively influence PPM quality (Unger et al., 2012), which in turn predicts portfolio success (Jonas et al., 2013).

3.2.2 Strategic Alignment

A strategy expresses how a business competes in the market against the competition (Varadarajan & Clark, 1994; Walker & Ruekert, 1987) and constitutes a set of ends with accompanying means (Levine, 2005). PPM is an application of those means the reach overall goals (ibid.) as projects are generally the primary tool to actualize business strategy (Poskela et al., 2003; Artoo & Dietrich, 2004). PPM is thus crucial for the implementation of strategy (Cleland, 1999; Dietrich & Lehtonen, 2005; Grundy, 2000; Shenhar et al., 2001; Srivannaboon & Milosevic, 2006) and the alignment is essential to the realization of organizational value through the project portfolio (Menke, 2013). The portfolio is regarded as the manifestation of business strategy (Cooper et al., 2001; Levine, 2005) and should reflect the relative emphasis on technologies, markets and products the business pursues (Cooper et al., 1999). Strategic alignment is often cited as one of the main goals of PPM (Cooper et al., 1999, 2001; Pennypacker & Dye, 2002) and also as a main benefit (LaBrosse, 2010). The connection between PPM and business strategy is well documented (Artoo, 2001; Morris & Jamieson, 2005) and its importance is broadly stressed (Artoo & Dietrich, 2004; Cooper et al., 2001; LaBrosse, 2010; Levine, 2005; Shenhar et al., 2007). As 32% of organizational sales are estimated to come from products launched during the previous 5 years, PPM has non-negligible bearing on the business’ future position (Griffin, 1997). When made a priority, PPM can be an effective mean to fulfill strategy (Jerbrant, 2014) and ought therefore to be considered in the strategic management process (Shenhar et al., 2001), whose effectiveness is a prerequisite for strategic alignment (Meskendahl, 2010).

Project selection in line with strategy positively correlates to the performance of the portfolio, and it is associated with both customer satisfaction and financial results (Müller et al., 2008). Guidelines for selection has been deemed the most deciding factor in portfolio alignment with strategy (Artoo & Dietrich, 2004; Cooper et al., 2001; Crawford et al., 2006; Dye & Pennypacker, 1999; Englund & Graham, 1999) and should therefore be used for all project candidates (Levine, 2005). Its importance is derived from the fact that the selections of projects is linked with business strategy (Cooper et al., 1999). Successful businesses have standardized routines for ensuring the projects in the portfolio are based on strategy rather than internal power dynamics (Müller et al., 2008).

Strategic alignment is usually discussed as the act of ensuring projects provide movement in the overall strategic direction (Martinsuo & Lehtonen, 2007; Killen et al., 2008; Teller et al., 2012; Unger et al., 2012; Voss & Kock, 2013). Strategic alignment of the resource allocation is often considered (e.g. Engwall & Jerbrant, 2003), but the alignment of project objectives with strategic aims is also highlighted as important (Jonas et al., 2013). Dietrich and Lehtonen (2005) developed the concept of strategic fit, which considers the project objective alignment with strategy, the resource alignment with strategy, and how well the portfolio mirrors the business strategy. Venkatraman (1989) in turn established the six-dimensional notion of strategic orientation, reduced by Meskendahl (2010) to three dimensions: analytical, aggressiveness and riskiness. The analytical dimension describes a business’ capacity to gather and act on data from the external environment regarding for example technologies and market development to build competencies and get ahead (Morgan & Strong, 2003). This means both internal strengths as well as environmental conditions should be considered in portfolio strategy decisions (Archer & Ghasemzadeh, 1999). Aggressiveness refers to attitude to external threats or opportunities (Covin & Covin, 1990) and a business’ inclination is seen as more important to companies in dynamic
environments (Venkatraman, 1989). It affects the intensity of the pursuit of innovations and the appropriation of it (Lumpkin & Dess, 2001; Meskendahl, 2010). The aggressiveness of the relationship to external changes influences the portfolio emphasis and dynamic, not least in terms of resource allocation and prioritization (Morgan & Strong, 2003). The level of riskiness depicts the organization’s view on likelihoods of outcome in the decision-making process (Talke, 2007). This also influences resource allocation during uncertainty (Dess & Lumpkin, 2005) as well as the inclination to expand to different markets and employ new technologies (Miller & Friesen, 1978). This all affects selection and the assessment of projects in relation to the overall strategic aims (Meskendahl, 2010).

Strategic buckets are categories of projects that management can pre-allocate resources to on an abstract level, in order to mirror strategy in spending. Due to senior managers having less insight into project specifics than project managers, the distribution of resources ought to be delegated to the people closer to the execution of the projects. The categories can be divided by project types, markets, technologies or product lines and the approach is used by some of the leading businesses (Cooper et al., 2000). Except aiding in strategic alignment, the buckets can also help diminish the information asymmetry in resource availability and demand that exists between senior and project managers (Hutchison-Krupat & Kavadias, 2014). There are indications from research that businesses’ ability to define and employ strategic bucket can be the distinguishing factor between the most and least innovative organizations (Barczak et al., 2009) and its use has a positive correlation with business performance (Kahn, 2013). The relative sizes of the buckets focusing on incremental and radical innovation, respectively, depend on environmental complexity, where the businesses in complex environments that have more radical projects perform better (Chao & Kavadias, 2008). Cordes and Stugbäck (2016) suggest the split between incremental and radical buckets should depend on how dynamic the environment is. They warrant more investments into disruptive and discontinuous projects, about 80 %, when dynamics are high, as opposed to the approximate 30 % for mature markets.

Strategic buckets, along with gap analyses, are central to implementing the strategy (Artto & Dietrich, 2004). Strategic methods of PPM have been shown to outperform other methods when it comes to creating project value, handling the number of projects and reducing time to market (Cooper et al., 1999), better so than financial methods that are more commonly used (Cooper et al., 2001). The best organizations regularly use strategic methods and also employ other methods in conjunction, especially scoring models result in higher performance. Bubble diagrams also perform well when it comes to strategic alignment (Cooper et al., 1999).

While academia has linked PPM to strategic implementation, the same is not always true for industry. 66% of strategy is left without implementation (Johnson, 2004) and only 63% of its potential value is captured (Mankins & Steele, 2005). In many organizations, the articulation and alignment of strategy with the portfolio needs to improve (Menke, 2013) since small projects often are prominent in the portfolio, due to lack of a product innovation strategy to give long term direction (Cooper et al., 2000). In fact, strategic alignment has been identified as a problem in industry within new product development (Cooper et al., 2000) and a systematic alignment between strategy and the goals for the portfolio is often missing (Elonen & Artto, 2003). Literature on strategic fit is still limited (Srivannaboon & Milosevic, 2006) and especially during dynamic circumstances.

Strategy is based on the environment, meaning that external changes need to result in modifications to the strategy (Venkatraman & Prescott, 1990). When changes occur more often, organizational flexibility becomes increasingly important, where flexibility is regarded as defense against turbulence (Dreyer & Grønhaug, 2004). The importance of the relation between flexibility and strategy is
highlighted by the fact that flexibility is not only regarding change and product development on current markets, but also regarding new markets and technologies (Volberda, 1998; Fahy & Smithee, 1999). Flexibility includes the ability to pick up and act on changes in the environment (Bettis & Hitt, 1995). This affects PPM, as changes to strategy also entails changes to the portfolio (PMI, 2008). PPM thus needs to be planning for the long term and deliver value over time, even as the external environment changes (Killen & Hunt, 2013). This can be regarded a dynamic capability (Teece et al., 1997) which, when aligned with strategy, allows for a higher portfolio performance (Meskendahl, 2010). This means in practice that the portfolio periodically needs to be reviewed to ensure its alignment with strategy (Cooper et al., 2000; Levine, 2005).

3.2.3 Resource Allocation

Resource allocation in PPM deals with the distribution of internal assets, interpreted broadly as employees, equipment, services, supplies, commodities, budgets and funds (PMI, 2008). Cooper et al. (2000) and Levine (2005) on the other hand reduces resources to two categories, people and capital, that need to be “allocated and re-allocated to the active projects” according to a widely accepted definition of PPM (Cooper et al., 2006). In a project portfolio, the projects compete for the same resources (Archer & Ghasemzadeh, 1999; Dye & Pennypacker, 1999), resulting in scarcity and a need for efficient spending of development resources on the right projects to reach product objectives (Cooper et al., 1999). Due to the dynamic character of the economic environment, resulting in shorter product life cycles, the allocation of resources is today integral to the survival of businesses (Cooper et al., 2001). Businesses successful in developing new products manage to focus resources on the proper projects (Levine, 2005) and efficient usage allows for a competitive advantage (Dreyer & Gronhaug, 2004). Within the resource-based view, unique resources form industry entry barriers (Wernerfelt, 1995) and can develop into a sustained competitive advantage (Barney, 1991).

According to Levine (2005), the allocation of financial resources should be divided into two levels. On the first level, funds should be allocated to strategic buckets to form an aggregated budget for projects with the same strategic direction, all together reflecting the overall strategic direction of the business. On the second level, the bucket budget is divided into project budgets according to the prioritization of projects within the respective buckets. Allocation of people is more difficult since it is dependent on available competencies, why the project mix need to be determined with respect to resource constraints, going beyond classical NPV calculations that do not handle comparative analyses well (Cooper et al., 2000). Capacity analysis is suggested to counter this issue (ibid.), which can be facilitated by keeping inventory on what resources are at hand at any given time (Levine, 2005). It is also important to consider that projects sharing people experience a knowledge transfer, that can be important when inter-dependencies exist (Nobeoka & Cusumano, 1997). Jonas et al. (2013) define allocation quality as “effective, efficient, and reliable assignment and redistribution of human resources within the project portfolio” and identifies it as a facet of management quality, which in turn impacts portfolio success.

Despite its importance, resource allocation has been identified as one of the main challenges for PPM (Cooper et al., 2000). When putting together the portfolio and evaluating projects, the access to vacant resources and the consequences of its allocation are rarely considered (ibid.). Resource shortage has also been identified as an issue in internal projects, but as at least budgets are ultimately common it causes shortage for NPD projects as well (Elonen & Artto, 2003). Engwall and Jerbrant (2003) introduces the so-called resource allocation syndrome, shedding light on a possibly universal issue for management in multi-project environments. It has even been suggested that the management of resources in R&D organizations is the worst performing of all PPM practices and that improvement is widely needed (Menke, 2013). Failure in resource allocation results in longer time-to-market, sub-par
information, lowered morale or even projects falling through completely (Elonen & Artto, 2003). The importance of avoiding resource conflict has also been highlighted (Engwall & Jerbrant, 2003). In organizations where the resources are owned by the line organization, line managers often take advantage of their power to affect the resource management, especially in immature PPM settings (Beringer et al., 2012). As continuity is required for efficient use of resources (Volberda, 1998), changing portfolios pose a problem to resource allocation (Martinsuo, 2013). In dynamic environments, resource re-allocation is identified as a PPM challenge (Killen & Hunt, 2013; Petit, 2012).

Many definitions of PPM and descriptions of resource allocations within PPM include re-allocation of resources, implying a certain degree of inherent flexibility. However, the flexibility of the resources varies across businesses, some hold on to commitments to create a stable environment whereas others re-allocate both people and budgets to reflect new priorities and changing conditions (Cooper et al., 2001). As complexity is increasing and the rate of change in the environment grows, businesses need to be more aware of how resources are spent (Elonen & Artto, 2003). The resource-based view explains the need for unique resources to create competitive advantages, but insufficiently deals with the fact that the resources also need to be re-allocated regularly to meet the demands of a changing environment and to accommodate for project additions (Petit, 2012). The competitiveness is thus based not only on the resources, but also on flexibility (Miller & Shamsie, 1996). If the resource needs of a project changes, the allocation throughout the portfolio has to follow (Engwall & Jerbrant, 2003), which can be done by reviewing the resource allocation periodically (Levine, 2005).

Dynamic capabilities are defined as “the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments” (Teece et al., 1997). PPM can be considered a dynamic capability (Killen & Hunt, 2013, Petit, 2012) as it deals with processes for re-allocation of resources (Eisenhardt & Martin, 2000), which is a central part of a dynamic capability (Killen & Hunt, 2013). The theory points out that the re-allocation needs to be constant (Petit, 2012), resulting in increased flexibility and resource agility which in turn contributes to a responsive organization (Killen & Hunt, 2013) capable of competing in dynamic environments (Killen & Hunt, 2010). Beyond budgeting is another concept focusing on resource agility, promoting distribution of resources as need arises, as opposed to through annual budgeting cycles (Libby & Lindsay, 2010).

### 3.2.4 Identification & Selection

Identification and selection is the process of determining which projects should populate the project portfolio. Cooper (2000) argues that an efficiently conducted PPM should connect the organization’s strategic goals with the selection and identification of projects. This eliminates potential subjectivity from the selection process. This line of reasoning is also supported by Levine (2005), who claims that the objective of selecting projects for the portfolio should be aligned with the organizational goals and strategies and the available resources to carry out the projects need also be considered. Furthermore, Müller et al. (2008) could demonstrate a positive correlation between project selection that was aligned with strategy and the attainment of desirable results, such as reduced cost, enhanced quality and customer satisfaction. However, according to Cooper (2000), this consideration seldom takes place.

In order to properly perform the portfolio selection process, Levine (2005) argues that the selection process should be administered by a team and the goal should be to remove factors such as power and emotion from the actual decision point. In order to make a qualified project selection, there are many different criteria that the management team could consider. Ideally, the organization should focus on 7-10 different selection criteria (LaBrosse, 2010). The most common are: return on investment, costs, risks, required resources, time frame, strategic fit, level of impact and constraints (ibid.). Even though
these criteria are considered in many cases, the activity of identification and selection still remains one of the most difficult processes to successfully carry out (Cooper et al., 1995b, 1996b). According to Elonen and Artto (2003) and Cooper et al. (1999), systematic project evaluation is often lacking and portfolio selection is thus viewed as a problem in PPM.

Furthermore, some criteria might be more important to company success than others. The strategic fit of projects is perhaps the most important criteria to consider and will be essential in ensuring the organization is executing the most important project (Artto, 2004; Cooper et al., 2001; Shenhar et al., 2007). Furthermore, it is well known that project selection criteria are significant drivers when it comes to aligning portfolios the organization’s strategic goals (Artto & Dietrich, 2004; Cooper et al., 2001; Crawford et al., 2006; Dye & Pennypacker, 1999; Englund & Graham, 1999).

Even though selection criteria are a fundamental aspect of the selection process, there are also other processes with which organizations struggle. For example, Cooper et al. (1998, 2000) mention multiple factors conditional to the selection process which companies struggle with. These include:

- reluctance to terminate projects
- selection of short term projects
- biased decision making
- no strategic link between the organization and new projects
- scarce resources
- lack of quality information when making decisions

These factors are the key drivers behind an insufficient project selection process and portfolio management (ibid.).

In regards to information shortage companies struggle with, Müller et al. (2008) argues that making accurate project prognoses is often difficult just by considering the nature of projects. The authors argue that it is insufficient to just consider the factors at the beginning of a project but instead focus on continuously evaluating the project. Engwall and Jerbrant (2003) concurs with this statement and adds that the portfolio profile needs to reflect the project’s risk profile. This implies that the selection of future projects in the portfolio needs to be altered in such a way that it is aligned with the risk profile of current projects (ibid.). Levine (2005) adds to this by arguing that in most cases, projects are selected based on currently available data. He argues that it is important to acknowledge that projects are intrinsically risky and that this risk will change as the project progresses. Subsequently, these changes may lead to the invalidation of the initial selection criteria (Cooper, 2000; Levine, 2005).

It is however difficult for management to accurately assess a project in its initial phase, as many times vital information is lacking in order to make sound decisions (Cooper et al., 2000). According to a study conducted on 300 different companies, Cooper (1996b) could conclude that the companies had significant weakness when gathering relevant data in the initial phase of the project. Weak areas included market analysis, technical assessment, market studies and business analysis (ibid.). According to Cooper (1995b), having a well-adapted and early product specification is key when trying to achieve short cycle times and profitability with new products.

In terms of companies struggling with scarce resources when selecting projects, Cooper et al. (2000) argues that available resources are seldom considered when selecting a new project. Instead, the majority of the focus lies on the financial analysis of the project (ibid.). However, this tends to lead to the judgement that all projects are beneficial, as a project would not be presented if it was not financially
reasonable. This way of reasoning will therefore lead to overpopulation of projects and eventually to a significant lack of resources.

However, the difficult factors brought forward by Cooper et al. (1998, 2000) could perhaps be prevented by having a formalized PPM structure. Cooper et al. (2001) argues that the absence of formalized selection methods, leads to decisions that are deviating from objectivity. Furthermore, Cooper et al. (2001) argues that the firms who demonstrate the best PPM performance, refrain from basing their project selection solely on the use of financial criteria. A commonly used method is NPV. However, this method was originally intended for decisions that only occurred at one specific time (Cooper et al., 2000). Instead, the NPV method is being used for comparing different project against each other and by doing so ignores the available resources and other constraints (ibid.). Cooper et al. (2000) suggests that a forced ranking method is used, where a list of all projects is created and all lower priority projects are killed or put on hold until more resources become available. However, this is seldom the case as many companies are reluctant to terminate projects exhibiting positive returns (ibid.).

Other methods brought forward by Cooper et al. (2000) include scoring models and bubble diagrams. The former might be insufficient as it only considers absolute criteria, rather than comparing projects against each other. More important projects will also get a higher score, which also implies a higher resource investment from the organization. The organization would have to balance the invested resources with the projects potential outcome. Bubble diagrams has an advantage in this case, as it takes all current projects in the portfolio into consideration and displays information about projects with the use of bubbles. However, it is a tool to display information and not to find an optimal list of projects to select (Cooper et al., 2000). Cooper et al. (2001) discusses available project selection methods by arguing that the best performing firms tend to utilize several different portfolio management techniques to select projects and manage their portfolio. There is not one method that solves all problems.

### 3.2.5 Prioritization

Project prioritization is the process of ranking projects relative to each other and it is central to maximizing the value of the portfolio as it favors projects with the highest contribution (Artto, 2004; Cooper et al., 2001; Shenhar et al., 2007) and clarifies organizational emphasis (Cooper et al., 1999), why it with advantage ought to be included in standard practice (Levine, 2005). It is one of the most commonly cited activities of PPM in the literature and is included explicitly in a widely used definition of PPM by Cooper et al. (1999). Prioritization has repeatedly been found to constitute a key success factor for PPM (e.g. Cooper et al., 1999; Elonen & Artto, 2003; Fricke et al., 2000) and it has been shown that successful businesses have implemented project prioritization processes to a higher degree (Müller et al., 2008). Despite this, prioritization has traditionally been found to be a weak link in new product development (Cooper et al., 1995a, 1996a) and is considered a main challenge for PPM (Cooper et al., 2000), often not performed at all (Cooper et al., 1999).

Prioritization can be used to force comparison between projects, rather than accepting all projects exhibiting a positive contribution, which leads to dispersion of resources (Cooper et al., 2000). To avoid prioritizing between projects of differing natures, strategic buckets can be used to partition between incomparable initiatives. Projects can thus be prioritized between each other within buckets (Cooper et al., 2001; Levine, 2005), but this is something lacking in many companies (Cooper et al., 2001). To prioritize, scoring models are commonly used and are also found effective (Cooper et al., 2000, 2001). Frequently used in a scoring model measures include return on investment, cost of project, required resources, risk, time frame, strategic fit, degree of impact and constraints (LaBrosse, 2010).
In order to plan for what projects to execute, the prioritization must be completed in an early phase of the project life cycle, without complete information (Cooper et al., 2001). Consequently, the prioritization is often poor and businesses need practices to handle additional information. Stage-gate models are commonly used in project management to manage project life cycles but can also support project prioritization processes as it enables fixed interval re-prioritization iteratively. The same approach can also be used to tackle changes in the external environment to create a more adaptable portfolio prioritization (Levine, 2005).

3.2.6 Communication & Decision-making

In order to have an effective project portfolio, it is of significant importance to establish that all involved parties within the PPM process are aware of their roles and that they are exercising their responsibilities to the fullest (Kendall & Rollins, 2003). According to the APM (2004), reporting is one of four most important aspects to consider when trying to establish an appropriate project management structure. This assertion is supported by studies suggesting a connection between the distribution of information and different performance metrics in multi-project settings (Fricke & Shenhar, 2000; Nobeoka & Cusumano, 1997). The presence of relevant information has a significant impact on the project-level as it greatly enhances the capability of PPM (Martinsuo & Lehtonen, 2007). Information quality, defined as “the transparency that is achieved over the whole scope of projects of a certain portfolio and the availability and reliability of project status information” has been shown to contribute to portfolio success (Jonas et al., 2013). Communication between the project and line organizations is implied, but also the reliability of underlying data in decision-making processes (ibid.), which has been highlighted as one of the major challenges of PPM (Elonen & Artto, 2003). Jonas et al. (2013) also indicate cooperation quality as precursor of portfolio success, referring to interproject cooperation. As the PPM process involves many actors, assistance and resolving conflicts through communication becomes crucial (ibid.).

Cable et al. (2004) adds to this by arguing that the portfolio will excel at the project-level if project reporting can provide information that is brought forward in a timely and effective manner. Additionally, Cable et al. (ibid.) argue the importance of performance measurement reporting. They assert that the process of performance reporting typically involves informing how well projects are doing right now and what has been achieved, as well as trying to predict the future state of the project. Müller et al. (2008) agrees with Cable et al. (2004) by stating that reporting on project and program level has a positive impact on the portfolio performance. They argue that top-performing firms display a mutual way of reporting from projects to the top-levels in the portfolio.

In order to effectively communicate and report within the portfolio, it is of importance to have clear roles and duties connected to these tasks. In their book about project portfolio management, Rad and Levin (2006) outline the responsibilities and duties that should be undertaken by different roles within the portfolio. For example they argue that the duty of the portfolio manager is to integrate all reporting systems within the firm. Additionally, they also have to understand the dynamics of communication, meeting management and financial management. If these duties are not fulfilled, an organization will never be able to reach a mature state (ibid.).

3.2.7 Number of Projects

Number of projects refers to the number of projects that are currently active in the portfolio and is emphasized by Cooper et al. (2001) as being one the most important factors of PPM. Attempting to perform an excessive number of projects with limited resources often result in subpar project delivery, failing new products and prolonged cycle times (Cooper et al., 1999, 2001).
It is usually constructive to analyze the number of projects in the project portfolio as this aspect of portfolio management is often most problematic for the majority of firms (Cooper et al., 1998). In the study presented by Cooper et al. (1998), 205 different companies were measured using six distinct performance metrics, revealing that number of projects was the metric scoring the lowest for both best practice firms and poor performing firms. Cooper et al. (1999) emphasized that successful companies had an appropriate number of projects in their portfolio and consequently projects were completed within the pre-set time limit of the project. Cooper et al. (1999, 2001) argues that because of this, no pipeline gridlock was observed in the case of the top performing companies.

The contemporary business climate is characterized by complexity and in order to handle rapid changes in the external environment companies must be attentive with their scarce resources and apply a clear focus (Elonen & Artto, 2003). Cooper et al. (1999) presents focus, in terms of number of projects, as one of the most important aspects of PPM. They argue that all businesses should strive to achieve high focus, as excessive resource usage will ultimately result in pipeline gridlock. Cooper et al. (2001) not only agrees with this, but also adds that it is significantly more valuable for businesses to focus their resources on “great” projects instead of doing too many projects that are not good enough.

3.2.8 Balance

Balancing of the portfolio refers to the formation of a project mix that impedes uniform portfolio content, which means evaluating projects not only on their absolute contribution but also in relation to other projects in the portfolio (Kendall & Rollins, 2003). Achieving portfolio balance is one of the main goals in PPM (Cooper et al., 2001; Levine, 2005; Pennypacker & Dye, 2002) and high performing businesses have significantly better balance (Cooper et al., 2006) while their management also actively pursue it (Levine, 2005). A balanced portfolio allows businesses to fulfil their strategic goals while minimizing risk exposure (Mikkola, 2001). It has been demonstrated that there exists a positive correlation between risk management and portfolio success (Teller & Kock, 2013). It has been proposed to be an item on the scorecard for ranking projects (ibid.), signaling its importance to overall portfolio success, but balancing the portfolio is still seen as a challenge going forward (Cooper et al., 2006). To visualize the portfolio and help balancing it, bubble diagrams have been put forward as a tool that perform well (Cooper et al., 1999).

There are several dimensions to consider in order to balance a portfolio (Archer & Ghasemzadeh, 1999; Cooper et al., 2002; Killen et al., 2008). However, a widely accepted set of dimensions is lacking (Meskendahl, 2010). Commonly mentioned are a balance between high and low risk and return (Chao & Kavadias, 2008; Cooper, 1999; Jonas et al., 2013; Killen et al., 2008; LaBrosse, 2010; Menke, 2013), long and short term (Archer & Ghasemzadeh, 1999; Chao & Kavadias, 2008; Cooper, 1999; LaBrosse, 2010; Menke, 2013) as well as incremental and radical technological innovation (Chao & Kavadias, 2008; Cooper, 1999; Killen et al., 2008; Killen & Hunt, 2013). Additional dimensions are recognized as resource demand (Archer & Ghasemzadeh, 1999; Killen et al., 2008), target market (Chao & Kavadias, 2008; Killen et al., 2008; Cooper, 1999) and cash flow timing (Killen et al., 2008; Mikkola, 2001).

Several of the dimensions are not mutually exclusive as, for example, radical innovation implies both a higher risk and a longer time frame, meaning that the mix of dimensions needs to be contingent on context (Meskendahl, 2010). Since the disruptiveness of the innovation affect many of the other dimensions, management of its balance is of critical importance. Successfully balancing disruptive and incremental innovation (Bower & Christensen, 1995) leads to ambidexterity (Tushman & O’Reilly, 1996), where incremental innovations serve today’s customers and finance radical innovation projects.
to serve future needs. Killen and Hunt (2013) refer to this as the balance between exploitation projects in the short term and exploration projects in the long term. It necessary to avoid the success trap where incremental innovation projects are favored since they more easily reach firm return requirements, despite firms knowing radical innovation is central to long-term competitiveness. This has led firms to develop parallel product development processes to explicitly manage the balance between different project types included in the same portfolio (Killen & Hunt, 2013).

3.2.9 Cultural Alignment
Organizational culture can be a source of sustained competitive advantage and should therefore be nurtured carefully (Barney, 1991). If the external environment (and then also the portfolio) is changing faster than the organizational culture, then it is the portfolio that needs to be adapted to the portfolio. Accordingly, PPM practices need to aligned with the existing culture and structure (Birgisson, 2012) and the projects selected must be consistent with the culture and values of the business (Levine, 2005). Meanwhile, a culture supporting a portfolio approach to product development is required, along with endorsement from top management (Cooper et al., 2001). Kotter (1995), although studying change management, underlines the importance of cultural alignment when making changes, which could be extended to strategic (and therefore also portfolio) changes.

3.3 Agile
The term agile originates in the field of software development, where agile methodologies has revolutionized the way software is developed. When working agile, the software development mainly follows the pattern of standardized activities that reappear throughout the development process (Pentland & Feldman, 2007). These activities are constructed around an iterative delivery model where deliveries are brought forward on a frequent basis and where daily meetings that are conducted in a stand-up fashion supports communication (Schwaber & Beedle, 2001; Williams, 2012). The agile methodology strives for eliminating the establishment of early design as well as having a permanent project scope (Serrador & Pinto, 2015). According to Serrador and Pinto (2015), traditional projects following an inflexible process of development, can result in significant customer frustration, the need for significant revision of already performed tasks and ultimately result in technological advances cannibalizing on the need for the original project (Serrador & Pinto, 2015).

In order to reduce the time to market while at the same time increasing flexibility, the agile methodology relies on its iterative model where feedback and vicinity to the customer is key. Without these functions, the positive outcome of the agile methodology would be minimized (Hoda et al., 2010; Stettina and Heijstek, 2011). Introducing agile activities might difficult for larger corporations where working procedures are standardized and part of the corporation’s culture (Stettina & Hörz, 2015), especially if they are seniority-based (Takeuchi & Nonaka, 2001).

To summarize the agile practices briefly covered above, it is suitable to look at the agile manifesto (Beck et al., 2001), which is a set of agile values compromised within the following statements:

- individuals and interactions over processes and tools
- working software over comprehensive documentation
- customer collaboration over contract negotiation
- responding to change over following a plan
These statements embody the agile methodology and separates it from the traditional way of conducting a project. Even though a different jargon and implementation is used by different practitioners, they all share the common values and philosophy originally presented in the agile manifesto (ibid.).

From the agile values a set of twelve agile principles are derived (ibid.):

- Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
- Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
- Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
- Business people and developers must work together daily throughout the project.
- Build projects around motivated individuals. Give them the environment and support they need and trust them to get the job done.
- The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
- Working software is the primary measure of progress.
- Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
- Continuous attention to technical excellence and good design enhances agility.
- Simplicity - the art of maximizing the amount of work not done - is essential.
- The best architectures, requirements, and designs emerge from self-organizing teams.
- At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

### 3.3.1 Scrum

Scrum is software development process utilized within the context of agile. It is utilized to adhere transparency while keeping the project team energized and concentrated on the next delivery (Sutherland et al., 2007). By following structured activities throughout the development process, the project teams are able to work autonomously and create systems where the architecture is growing (ibid.). Ideally, the implementation of Scrum reduces time to market while at the same time aligning the organization’s goals with that of the team members (ibid.). Furthermore, Scrum focuses on co-creation with shareholders and promotes active communication throughout all levels in the organization (ibid.).

In order to achieve the benefits of Scrum, there are processes and roles which apply to those involved. According to Sutherland and Schwaber (2016), the three most common roles are:

- Product owner
- Scrum master
- Development team

These three roles are constantly interacting with each other while working on delivering their next intermediate result. This occurs during a specific period of time which is denoted in agile context as a sprint.
Scrum framework
The activities of Scrum commence with the vision the product owner wishes to execute. This vision should be communicated through the product backlog which represents a prioritized list of functionalities which the product owner desires to develop. When the product backlog is created and properly communicated to the team, a sprint begins. This sprint starts with a planning meeting and is finalized with a sprint review and sprint retrospective, usually 2 weeks later (Rubin, 2012; Sutherland & Schwaber, 2016).

The initial phase, the planning meeting, allows the team to choose the most important functionality from the product backlog and create a sprint backlog containing the functionality which the team believes to finalize at the end of the sprint. Furthermore, when the sprint is commenced, the team conducts daily scrum meetings. These meetings serve as a way for the team to align their work with all team members and to investigate whether the team is on the right track to complete the items in the sprint backlog. These meeting are usually conducted standing up and usually do not exceed the 15-minute mark (Rubin, 2012; Sutherland & Schwaber, 2016).

Lastly, the sprint is finished after completing a sprint review and sprint retrospective. The former is a way for the team and the shareholder the investigate the created product. The objective is to jointly identify hurdles which have been identified during the sprint with a strong focus on the product being built. These hurdles are then jointly discussed and ultimately led to a revised product backlog which can be used as basis for the upcoming sprint. However, before this occurs, a final activity called the sprint retrospective takes place. This activity is more focused on the process and the people of creating the product. The scrum team’s objective is to jointly discuss whether the daily work could be improved in order to facilitate the completion of product backlog items. The insights from this meeting are used in the subsequent sprints (Rubin, 2012; Sutherland & Schwaber, 2016).

3.4 Agile Project Portfolio Management
As outlined in the previous section, the agile philosophy started in software development and evolved to revolutionize project management (Abrahamsson et al., 2009; Dybå & Dingsøyr, 2008). The importance of aligning the portfolio practices with this subsequently became apparent, starting initiatives to extend the agility to neighboring practices. To extend the advantages of agile to a wider context, research on agile outside individual projects is warranted, especially in larger organizations (Augustine, 2009; Kettunen & Laanti, 2008; Larman & Vodde, 2009; Lee & Yong, 2009; Stettina & Hörz, 2015). Development efforts in whole have to be able to rapidly answer to new opportunities, threats and market requirements (Rönkkö et al. 2009, Ktata & Levesque 2010, Cusumano, 2008). Since PPM links strategy with operations (Martinsuo & Lehtonen, 2007), it constitutes an opportunity to implement agility beyond individual projects (Stettina & Hörz, 2015). However, deep knowledge on agile project management is not enough to properly apply agile to PPM, as time is needed to overcome the contradictory practices of agile and legacy philosophies. The research on APPM is still scarce and the need for further studies is emphasized (ibid.). However, Steindl (2005) claims the results of agile can be achieved without applying an agile approach, but also that its implementation may be worth the effort due to the possible productivity boost it entails. The contributions to the field that do exist, come from both practitioners and academics. Practitioners have described implementations of APPM and developed several frameworks to aid in scaling agile from the team level to the portfolio, focusing largely on processes and roles (see section 3.5). In recent years, academics have started researching the topic and the findings will be covered below.
There are several reasons to adopt APPM according to the literature. The adaptability enabled by APPM is seen as a prerequisite for survival due to the increased speed of the development of new innovations (Moore, 2011). As many products are quickly reversed engineered and copied, the need for constantly producing novelty becomes crucial (Zhou, 2006; Zeng, 2007). This has led to market uncertainty, which heightens the need to be flexibility both in terms of what and how much is produced (Christopher, 2000). Furthermore, as the digitalization and the move toward software has made updates virtually free of transaction costs, time to market and payback calculation times have reduced significantly (Abrahamsson, 2007; Reinertsen, 2009).

Crudely, agile organizations learn fast and are effective (Conboy, 2009; Laanti et al., 2013). However, there are different sides to agility, Laanti (2014) mentions 8 aspects of agile scaled to PPM: strategic agility, business agility, agile organization, people agility, tools agility, organizational culture, agility of the product that is built (see also Kettunen & Laanti, 2008) and agility of payoff functions. Especially in large businesses with complex processes, products and structures, a comprehensive view of agility is required (ibid.). On the other hand, the adopted aspects and practices must be tailored to the specific organizational context (Hoda et al., 2010). The needed level of agility varies with environmental and product characteristics, which should be reflected in the initiatives taken (Kettunen & Laanti, 2008). Context has been cited as the most important factor to deciding the extent of agile adoption and experimentation with agility is encouraged, while still remaining focused on why it is pursued (Vaidya, 2014). Steindl (2005) divides agility into three organizational levels: project, portfolio and business. Even though they share the same underlying principles, agility have slightly different meanings on the respective levels as complexity grows. Best performance is achieved when agile is implemented on all three levels and aligned around common principles and practices (ibid.).

**Principles of Scaled Agile**

The question whether the twelve principles of agile in team level software development can be applied when scaled to the portfolio level is brought up by Laanti (2014). The result is a new list containing 21 principles of scaled agile (see Table 3 below). These can be considered as philosophical guideline to keep in mind when implementing and improving APPM.

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<td>The content is the key</td>
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<td>Co-creation</td>
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<td>Feedback is the fuel to learning</td>
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<td>Business agility</td>
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<td>5.</td>
<td>Use of automation as leverage</td>
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<td>6.</td>
<td>Scale using fractals</td>
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<td>7.</td>
<td>Avoid combinatorial explosions</td>
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<td>8.</td>
<td>Sequence for maximal throughput</td>
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<td>9.</td>
<td>Appreciate deep knowledge</td>
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<td>10.</td>
<td>Work leveling</td>
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<td>11.</td>
<td>Simplicity</td>
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### 3 Literature Review

#### Challenges in APPM

In terms of challenges in deployment of APPM, Stettina and Hörz (2015) report that more than half are related to processes. More specifically, when implementing agile into PPM, it has been difficult to achieve alignment with existing processes (regarded as the biggest challenge), commitment from staff and senior management to the new process and simultaneous, efficient resource allocation and re-allocation of teams to projects. They also report that about 20% are related to people (culture and trust), about 15% to the organization (hierarchies, bureaucracy, change and portfolio governance) and about 5% is technology related (legacy PPM systems). Other scholars have reported challenges in strategic alignment, managing dependencies (Aubry et al., 2007; Hodgkins & Hohmann, 2007; Kalliney, 2009), prioritization and resource allocation (Rautiainen et al., 2011; Thomas & Baker, 2008).

Hodgkins and Hohmann (2007) found strategic alignment to be problematic when using team backlogs in the agile program management office. Roadmaps were thus implemented to tie strategy and operations together, by aiding in the prioritization process and in the discussions on strategic direction and market opportunities. Kalliney (2009) also report difficulties with maintaining strategic direction once the transition to APPM had been made, since team level work items were too small to confirm their strategic contribution. To counter this, it is suggested to maintain a central constantly up-to-date and prioritized backlog mirroring business goals. This, along with mechanisms to sense market dynamics, strategic alignment can be achieved (ibid.).

Over time, silos of knowledge will build up in any organization. This is especially true for organizations with functional structure, since each department focuses on one specific task. These can be a challenge to overcome once settled, which can become problematic in an agile transformation (ibid.). Kalliney (ibid.) suggests implementations of formal knowledge sharing programs to defeat these knowledge silos. Kettunen & Laanti (2008) highlights the fact that an agile business must value people who are multicompetent and nurture its intellectual capital.

#### Benefits of APPM

A wide range of benefits of APPM have been noted as well. Market adaptability, in terms of responsiveness, focus, variability and resilience toward external changes, was improved at business

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<td>Situationality</td>
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<td>13.</td>
<td>Control process, not items</td>
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<td>14.</td>
<td>Growth mindset</td>
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<td>15.</td>
<td>Listen to employees, they know all the problems</td>
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<td>16.</td>
<td>Detect and use patterns</td>
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<td>17.</td>
<td>Cost innovation</td>
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<td>18.</td>
<td>Utilize tacit knowledge</td>
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<td>19.</td>
<td>Learning happens between teams</td>
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<td>20.</td>
<td>Fast is better than perfection</td>
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<td>21.</td>
<td>Prevent problems when small</td>
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*Table 3. The 21 principles of scaled agile (Laanti, 2014).*
level (Steindl, 2005). When it comes to the portfolio level, reduced risk, reduced complexity, improved utilization of resources and increased flexibility and productivity has been found to be associated with APPM (ibid.). Also, the lesser focus on pre-planning leads to adaptability to changes and stable team configurations with multiple competencies have been linked with simplified resource allocations between successive projects (Abrantes & Figueiredo, 2015). Laanti et al. (2011) surveyed participants in APPM, who expressed higher work satisfaction, perceived effectiveness, better quality, autonomy and transparency, increased happiness and quicker detection of problems.

Stettina & Hörz (2015) identifies process-related benefits to be the main contribution from APPM. For organizations employing APPM this includes closer interaction between domains (found to be the biggest benefit), better alignment with customer needs and improved coordination through common backlogs, increased and earlier involvement from stakeholders as well as enhanced planning as transparency helps display actual project statuses. They also report benefits to people and organizations.

**Characteristics of APPM**

When businesses look to implement agile methodologies in their PPM, they are likely to face contradictory characteristics. The agile philosophy features approaches fundamentally different to legacy practices (Nerur & Balijepally, 2007; Thummadi et al., 2011). Legacy PPM entails linearity, clashing with the iterative nature of agile that is central to its value (Hoda et al., 2010; Stettina & Heijstek, 2011; Stettina & Hörz, 2015). This iterativity affects organizational routines (Pentland & Feldman, 2007) such as internal and external feedback loops, coordination, intermediate product delivery and portfolio evaluation (Karlström & Runeson, 2006; Schwaber & Beedle, 2001; Williams, 2012). As opposed to traditional PPM, agile methodologies welcome uncertain and changing environments (Nerur & Balijepally, 2007). The sequential phase view of traditional PPM has moved critics to regard it as fundamentally incompatible with agile methodologies (Krebs, 2008). Another difference is the differing granularity of planning which can result in contradictory processes (Karlström & Runeson, 2006). However, the informal approach to planning in agile can become very tiresome and expensive when expanded from smaller projects to entire complex portfolios (Abrantes & Figueiredo, 2015). On the other hand, Steindl (2005) points at some characteristics of agile methodologies that can be lifted to the portfolio level processes. He mentions working in pairs, distribution of power and stopping work to investigate root causes in case of arising issues. Kalliney (2009) adds to this by emphasizing the implementation of shorter release cycles on the portfolio level.

Stettina and Hörz (2015) derives four common characteristics of APPM from theory and empirics. First, there is an emphasis on resource and work item transparency in APPM (also Scaled Agile Inc, 2016; Vähäniitty, 2012), promoting trust while facilitating decision-making and resource allocation. The upkeep of a central portfolio containing all ongoing and planned projects is commonly mentioned as a way to improve transparency (for example Laanti, 2008). Even though a multiplicity of portfolios is not completely dismissed (Krebs, 2008; PMI, 2008), it is regarded detrimental to resource transparency and can cause problems when dependencies between portfolios occur (Stettina & Hörz, 2015). A prioritized strategic portfolio backlog helps visualize all current initiatives, coordinate tasks between different teams (Rautiainen & Vähäniitty, 2011) and provide agility to the strategic alignment (Stettina & Hörz, 2015). Backlog management can be more effectively applied to a single backlog (Larman, 2010; Larman & Vodde, 2009) and it prevents dispersion of portfolio resources to “invisible” projects (Blichfeldt & Eskerod, 2008). Decisions regarding the portfolio can then be made for each sprint, keeping it in cadence with the operations of product development (Krebs, 2009; Rothman, 2016).
Second, routinized collaboration between different parts of the portfolio is highlighted, as it provides recurring feedback opportunities. A shared understanding of strategy is needed for the pursuit of common goals and discussions across domains help create that understanding. Thus, frequent collaboration between teams are generally associated with agile methodologies. Traditional agile methods depend on face to face communication, but as complexity grows with the abstraction levels, documented knowledge becomes increasingly important. This needs to be backed by suitable artifacts and templates, which will impact both the success and sustainability of collaboration (Stettina et al., 2012). PPM practices need to be adapted to the interactions on project level to unlock to benefits of agility on the portfolio level (Stettina & Hörz, 2015). Just as in functionally structured businesses, the divide between different groups entails difficulties in managing dependencies and high-level risks (Kalliney, 2009). Stettina & Hörz (2015) report that more interaction is needed between different groups on all levels in the portfolio.

Third, commitment to the decisions made in the portfolio, by all involved stakeholders, is mentioned. Especially the commitment and active participation of senior management is highlighted. Commitment is increased through awareness sessions and implication clarity (ibid.). Fourth and last, Stettina and Hörz (ibid.) consider the usage of teams applied in the APPM processes, resulting in resource stability and multicompetent groups performing tasks. As resources often have to be reconfigured between teams and projects, stable teams assigned to one or two projects can help prevent unrest and reportedly improve quality (ibid.). This team stability is central to provide a sense of cohesion when changes are otherwise frequent (Ballesteros-Pérez et al., 2012). Tasks can then be pulled from a strategic backlog by these teams, as opposed by individuals, simplifying the task distribution process.

Effects of Agile on PPM

According to Stettina and Hörz (2015), the introduction of agile into the portfolio mainly affects three aspects of PPM. First, the frequency of routines in agile methodologies, such as reviews and stand-up meetings, needs to be matched in and expanded to the PPM processes. This means increasing the number of portfolio meetings so up to date information can flow quickly between operational and strategic levels within the organization. These reviews provide an updated status on projects and information to portfolio decision-making processes (Rautiainen & Vähiäniitty, 2011). For example, Kalliney (2009) reports on implementation of quarterly meetings to discuss high level roadmaps, dependencies and risks which has helped to increase the interaction between teams. Vähiäniitty et al. (2010) points out that issues with synchronization can lead to problems. The portfolio reviews need to be sufficiently frequent and match the delivery intervals of the teams, so that constant feedback can be provided (Stettina & Hörz, 2015). This also includes frequently revising the resource allocation to projects (Shalloway et al, 2010). Stettina and Hörz (2015) concludes that monthly reviews seem to suit a majority of companies. Furthermore, agile organizations also need frequent releases of new products and features according to market changes (Kettunen & Laanti, 2008). Kalliney (2009) suggests a release every quarter but points out that predictability can be achieved without locking the release in three months in advance.

Second, as the consistent and self-managing teams in agile take over activities and responsibilities (such as assignment of tasks, conducting estimations as well as scheduling and iteration planning) from project and portfolio managers, new organizational structures and roles need to be considered. Human development resources are often divided into autonomous multicompetent teams (Stettina & Hörz, 2015). Larman & Vodde (2009) reports grouping of teams to form so called requirement areas, based on a customer aspect of the product rather than its architecture. This is supposed to increase interaction between teams affecting the same product features, that not a single team have responsibility over
Kettunen & Laanti (2008) follow a similar line, suggesting agile organizations are broken down into several virtual organizations that work like small entrepreneurial businesses and can be constantly reconfigured. Kalliney (2009) reports that the separation of product strategy from the product development process can aid in APPM, since the product strategy team could keep an external focus, performing market research and trend spotting. Third, the values need to be adapted as the increased interaction between different domains that is necessary for agile practices demands a common understanding (Stettina & Hörz, 2015).

Key Activities
When APPM has been employed in businesses, a few key activities and practices have been identified. These are all present in legacy PPM, only the approach to them within APPM is different. Stettina & Hörz (2015) find four categories of activities that support an agile approach to PPM. Strategize and roadmap refers to the process to develop and follow the strategic direction, usually conducted by top management once every 12 to 36 months. This is aligned with what a majority of other scholars describe, see for example roadmapping by Vähänniitty et al. (2012). Identify and funnel describes how project candidates are identified and funneled into the development process. This process collects ideas from all of the business and accumulates them. Review, prioritize and balance is the continuous process of evaluating projects in the portfolio as a whole. As such, it is central to the agility of the portfolio and aims to ensure that the portfolio mirrors the business strategy. This is done anywhere in between as seldom as once a year to as often as once every two weeks. Allocate and delegate refers to the process of distributing resources and tasks. Resource allocation is done at the portfolio level, while task delegation is commonly handled by project teams. The distribution of tasks in agile methodologies utilizes project backlogs from which the teams pull their tasks, as opposed to traditional project management where a project manager delegate activities. The backlog is then updated after each sprint, which commonly lasts between one and four weeks (Stettina & Hörz, 2015).

Implementation
There are different views on how APPM is to be implemented, which can be divided into two categories according to Vaidya (2014). Some believe the transformation toward agile needs to be done holistically and radically, changing structures, cultures and traditional practices at once to accommodate for the agile philosophy. Others advocate for a more incremental approach through the introduction of agile methods one at a time during a transition period, to reap and build on the continuous gains from the transformation (ibid.). The implementation can also occur bottom-up or top-down (Steindl, 2005). While bottom-up approaches rely on the scaling of agile methods from project level to enterprise level (for example SAFe, see section 3.5), top-down approaches start with the business needs and align processes around that by breaking it down to the portfolio and project levels (Steindl, 2005). The most common approach is bottom-up, originating in individual software development projects (Stettina & Hörz, 2015). Vähänniitty et al. (2012) suggest a sequential approach to introducing APPM. First, a prioritized list of all projects should be made public to the organization. Second, incentive systems should be revised to promote global optimization. Third and last, a steering committee should be established to regularly meet and make update priorities and resource allocations.

Frameworks
Apart from the frameworks developed by practitioners, some academics have proposed frameworks for APPM. As they lack sufficient empirical evaluation, it is difficult to determine which performs best in which situations (Stettina & Hörz, 2015). The process frameworks adopted should be flexible, allowing for adaptation to the specific needs of individual teams (Kettunen & Laanti, 2008). Krebs (2008) presents a framework for PPM based on agile principles, aiming to describe how a portfolio can be
3 Literature Review

managed dynamically. He identifies three parts of portfolio management (project, resource and asset portfolio management) to consider in APPM and discusses the greatest challenges within each. In the project portfolio, too many projects are executed simultaneously and they are balanced poorly. The resource portfolio lacks vision, sufficient resources of the right type and feedback. The asset portfolio is inhibited by traditional PPM systems and underestimations of costs. According to Krebs (2008), centralized responsibility over the portfolio, resource transparency, the use of holistic dashboards as well as the monitoring of quality and team morale can help remedy these challenges.

Vähäniitty et al. (2012), although studying small software organizations, also put forward a framework for APPM aimed at connecting business decisions to development efforts through three key processes divided on two different levels of decision-making aimed at connecting strategy with operations. So-called product portfolio management involves roadmapping and release planning, and is the higher and more strategic of the two levels, that deals with what products that are to be developed and offered. Roadmapping is the process to arranging projects in the backlog so the evolution of product developments ensures that strategic business goals are met, forming a plan for the foreseeable future. Release planning, on the other hand, means planning for a shorter term, detailing the contents of the next coming release. Development portfolio management is the other level and the third key process, concerned with resource allocation, prioritization, task distribution and resolving conflicts (Vähäniitty, 2012). Szőke (2011) also divides planning into two levels, a rough release plan followed by a detailed sprint plan. This progressively detailed planning helps create predictable deliveries (Szőke, 2011). According to Vähäniitty (2012), the hierarchy of goals creates a transparent link between long term goals and daily activities, facilitating effective decision-making on the different levels of PPM based on open priorities. Improved planning helps mitigate risks and increases the agility of the portfolio (Kalliney, 2009).

Another approach is presented by Poppendieck and Poppendieck (2010). First, development efforts are categorized. Then, a cycle time is set for each type of effort and the resulting occasions are locked into the calendar. Finally, when these dates are reached, the content of the effort is reviewed according to what is prioritized in the business at that time. During the industry case studies of Stettina and Hörz (2015), however, none of these frameworks (nor the practitioner frameworks) were used.

Leadership

Vähäniitty et al. (2012) identifies three groups of actors in APPM, top management, strategic release management and software development management. This is concurrent with Stettina and Hörz (2015) categorizing actors into the three groups senior management, portfolio management and projects management. Despite the utilization of self-managing teams in agile, management is still crucial to the success of the agile portfolio in product development. Responsibility over the success of the projects is shared between the product owner, the project manager representing the overall organization and the scrummaster representing the individual teams (Stettina & Hörz, 2015). However, senior management commitment, participation and support is regarded crucial to both project (Young & Jordan, 2008) and APPM success, especially when it is implemented bottom up (Scaled Agile Inc, 2016; Stettina & Hörz, 2015). Despite this, active involvement is often lacking. This can be a result of the uncertainty changes in structures and roles can bring during an agile transformation. The empowerment of teams and increased transparency has been observed as a threat to the power of management (Stettina & Hörz, 2015).
3.5 Scaled Agile Framework - SAFe

The success of the agile philosophy has lead people to try to expand it to other domains, to widely reap the benefits associated with increased flexibility, but also to align the organization around the agile practices at the team level. Scaled agile framework is a framework for scaling agile methodologies from team level operations to the portfolio and business level (Scaled Agile Inc, 2018). It is developed by practitioners but is not the only framework for scaling agile. According to Vaidya (2014), there are mainly three different frameworks which are focused on scaling team-level activities to higher levels in the organization. These are: Disciplined Agile Delivery (DAD), Large-Scale Scrum (LeSS), and Scaled Agile Framework (SAFe). Vaidya (2014) argues that the organization’s situation is what matters most when choosing a specific framework and that in most cases, organizations need to try a variety of practices before they can commit to a framework. In the case of this thesis, we have chosen to solely focus on discussing SAFe, as it is the framework currently being studied at the case company.

SAFe is a framework which facilitates interaction between agile teams and provides a way of scaling lean-agile activities on the team level, to higher levels within the organization. Due to the modular and scalable nature of SAFe, organizations are able to solve difficult scaling problems as well as complex problems which require extensive coordination between different levels of management and teams (Scaled Agile Inc, 2016).

Depending on the organization’s complexity, a different amount of levels need to be considered when scaling activities on the team level. For organizations that build solutions that require hundred or more practitioners, the 4-level view is often adopted (Scaled Agile Inc, 2016). A comprehensive view of SAFe is depicted in Figure 7, followed by explanations of its four different levels.
Team Level
A significant change in traditional software development occurred alongside the establishment of the agile manifesto (Beck et al., 2001). The agile manifesto was centered around the team and removing potential obstacles that might obstruct the team’s performance. SAFe builds on this by empowering Agile teams and regarding them as essential for value delivery (Scaled Agile Inc, 2018).

The team’s objective is to perform the items stated in the product backlog, also known as user stories. These stories are evaluated, executed and later tested throughout the course of a sprint. By utilizing the same sprint length across the entire organization, it is possible to coordinate the work across all teams, which makes dependencies easier to manage across teams.

The key to the agile teams reaching their objective is through frequent communication and teamwork, supported by a decision system which is both quick and definite. Furthermore, collaboration between teams is strongly encouraged as it is a way for teams to handle deliveries that are reliant on other team’s activities. Lastly, the team members are linked together by a vision communicated by the product owner. In order for the team to reach a high performing state, this vision needs to be properly communicated and asserted to allow the team members to become motivated and perform at their best (Scaled Agile Inc, 2016).
Program Level
The program level is constituted by the Agile Release Train (ART). Generally, the ART includes 5-12 agile teams as well as relevant stakeholders. Together, the agile teams and the shareholders are responsible for planning, evaluating and testing the solution. Therefore, the ART serves in many ways as a large agile team creating a shared mission for the organization and the involved teams, creating a clear path forward in the development process (Scaled Agile Inc, 2016).

Value Stream Level
Larger software development projects require additional tools for coordination. The value stream level includes a framework for handling the coordination of multiple ARTs. Additional stakeholders and suppliers are included within this level and they are interacting with the agile teams to reach the objectives of a certain value stream. These objectives are communicated through Program Increment (PI) planning, which is a planning meeting on the program level conducted before and after every PI. Generally, the PI consists of five sprints that are two weeks in duration, adding up to a total of 10 weeks (Scaled Agile Inc, 2016).

Portfolio Level
The portfolio level in SAFe is responsible for operationalizing the organization’s strategy. This is done by distributing funds from the budget to different value streams aligned with distinct strategic themes, where every value stream seeks to fulfill a different strategic objective of the firm. The value streams originate from the portfolio backlog, which contains activities which the organizations desires to carry out. These activities could for example include technological investments which need to be carried out, or complex platform improvements necessary to support such technologies. The portfolio level also acts as a support function, which is responsible for developing support systems to the various value streams. The funding is accomplished through the means of lean-agile budgeting (Scaled Agile Inc, 2016).

Prioritization within SAFe
The literature on changes in priorities in PPM is scarce and not much is known about the active management of portfolios after the initial prioritization has been made (Petit, 2012). Hence, practitioners have developed models to address re-prioritizations. Within SAFe there is a backlog branching out from portfolio to team level, providing one prioritized chain of projects throughout the organization. In theory, this means that the strategic re-prioritization of projects due to external changes would ripple through the organization. The agile mindset SAFe is founded upon encourages reevaluation of the prioritization, providing a possible point of departure for businesses wanting to manage their portfolio actively even after the initial prioritization. The prioritization itself is based on Weighted Shortest Job First (WSJF), a model designed to maximize financial output. It is calculated by dividing Cost of Delay by Job Duration, meaning it favors projects that quickly produces high value (Scaled Agile Inc, 2018). The strong focus on financial benefit renders the WSJF model on the other hand suboptimal, partly since it is mono-faceted and partly because there are other evaluation criteria that has a stronger correlation to portfolio performance (Cooper et al., 2001).

Balance within SAFe
Ambidexterity is associated with adaptive capabilities as it allows firms to align themselves with both present and future demands (Staber & Sydow, 2002), but there is little research on how to update and continuously re-balance the portfolio. It is suggested that stage-gate models can be used to periodically review the balance (Cooper et al., 2000), but no market push approaches have been developed to keep the portfolio balanced to accommodate for external changes. This shortcoming also applies outside the academic community, as Scaled Agile Inc (2018) relies on weighted shortest job first with focus on
financial measures, it contains no process for balancing the portfolio across aforementioned dimensions. On the other hand, Scaled Agile Inc (2018) includes enablers, initiatives in support of other product development projects and one type of enabler is the exploration enabler, designed to encourage more radical projects. Such efforts will ensure the portfolio is populated not only projects selected for short term profitability, but does not provide processes for balancing.

**Communication & Decision-making within SAFe**

In SAFe, there are several structures facilitating communication and decision-making. On the team level, cross functional teams work together whilst product owners are in charge of the team backlog. Internally, each team discusses their project progress on a daily basis. A retrospective meeting is then conducted after every sprint where the team looks back on their performance. The scrum master is a facilitator and enabler for the teams and they provide guidance throughout the project. On the program level, multiple teams are working together to complete the business features provided by the program manager from the program backlog. On the program level, the train is governed by a release train engineer who acts as a scrum master for the release train. They are closely related to the solution manager, who has the content authority on the program level (Scaled Agile Inc, 2018).

All projects follow a program increment, which means that projects are run in five cycles where every cycle constitutes a two-week period. Each program increment begins with a planning meeting where each can learn about the vision for the projects ahead. The teams can then plan their work and also map interdependencies between projects. Furthermore, bi-weekly meetings are conducted between scrum master and the release train engineers to guarantee that projects are run according to the plan (Scaled Agile Inc, 2018). Lastly, on the portfolio level, there is lean portfolio management and epic owners. Lean portfolio management has the highest authority within the organization and ultimately has the utmost control of the all products and the solutions (Scaled Agile Inc, 2018).

**SAFe Criticism**

Even though SAFe is depicted as being a way of appraising the team and efficiently scaling team activities to different levels within the organization, there are critics questioning the applicability of SAFe. One of those critics is Jeffries (2014), who argues that organizations get a false sense of security when they implement SAFe. Jeffries (2014) continues by arguing that many organizations fail to reach a state of high innovation, high commitment and true agility, simply because they fail to realize that implementing the methods of SAFe will not automatically result in those things. Vaidya (2014) concurs with Jeffries and adds that organizations that are attempting to gain a competitive advantage in today’s competitive landscape, might be exposed to a major risk.
Chapter 5 is structured according to the analytical framework and presents the results of the empirical data collection. This includes the results from the interviews, observations, document reading and the survey. These results will then be discussed in relation to the literature review in chapter 6.

4.1 Analytical Framework

The field of PPM is large and diverse. Thus, an analytical framework was designed to guide, structure and facilitate the iterative empirical research on the PPM process. The framework emerged gradually throughout the process and was ultimately constructed according to nine themes (see Table 4 below), primarily inspired by the theories of Cooper et al. (1997, 2000, 2001). Cooper et al. (ibid.) states that the most common goals for organizations utilizing PPM are value maximization, portfolio balance, strategic alignment and having the right number of projects. These four aspects of PPM were the analytical themes that exclusively populated the framework initially.

However, given the abductive approach, these themes were further reworked and developed in conjunction with the empirical data as well as the literature study. The goals of PPM presented by Cooper et al. (2001) could by themselves be used to analyze PPM processes, but we found it did not provide enough granularity to be used as an analytical tool when mapping the processes of PPM with the purpose of capturing PPM dimensions to assess agility. Since they are not all-encompassing, the analytical framework used in this thesis includes additions. Moreover, value maximization is this thesis treated as the overall end goal of PPM and is therefore not suited in a framework more focused on processes and was thus subsequently removed. The order of the themes is not significant other than that they are presented to make linear sense to the reader. The relevance of the themes for PPM in industry was validated throughout the empirical data collection.

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*Table 4. The nine themes of the analytical framework.*

To understand why certain themes have been included in the analytical framework, it is important to understand how the concept of PPM has been defined in this master thesis. Since different definitions of PPM yield different constructions of the analytical framework and likewise determine what areas of
PPM that are in focus when answering the research question. Consequently, the following definition brought forward by Levine (2005) has been chosen as a base upon which this thesis lies:

“PPM is a set of processes, supported by people and tools, to guide the enterprise in selecting the right projects and the right number of projects, and maintaining a portfolio of projects that will maximize the enterprise’s strategic goals, efficient use of resources, stakeholder satisfaction, and the bottom line.” (p. 70)

The definition focuses on processes and separates them from the end goals. Given this definition of PPM and the abductive approach conducted within this thesis, it was possible to further elaborate and develop the themes as we progressed in the study. The analytical framework also allowed for the identification of themes needing to be agile as well as which of these are insufficiently agile today. The application of a framework for legacy PPM to assess agility is based on the rationale that APPM capabilities and practices can be implemented incrementally on top of existing processes (Vaidya, 2014).

### 4.2 Interview Results

The case company for this thesis is a large multinational company in the industrial automotive industry. It has a long history, and can thus be classified as a traditional company, within the historically conventional industry. The case company is a matrix organization where people are employed within the line organization, but are also assigned to projects part time, where they are subordinate to the project manager. The project organization is responsible for project execution of development projects. The line organization has a hierarchical and cross-functional structure with different functionally divided departments, along with support functions. As the products being developed are of complex nature, the cross-functional structure allows for collaboration in a constantly changing environment. However, it is not only the industry that is changing. The case company has received a new major external shareholder with high demands on flexibility and payoff, stipulating a higher focus on value maximization of the portfolio.

Throughout the subsequent chapters, the case company’s internal organization is referenced. To provide structure for the reader, the company’s department structure has been depicted in Figure 8 below.

![Hierarchy for the different departments below top management at the case company.](image)

The project portfolio of development projects contains 200-300 different projects, divided into two categories. Concept development projects are run by the moderating department (helping to structure the concept development) and the product development projects are run by the project organization.
The complexity of the product means many projects have a long cycle time and many dependencies between them, demanding continuous coordination and collaboration.

The case company is experiencing a growing awareness of both their own PPM and the increasing turbulence in their industry. Even though their historic approach is functional, they have realized the need to pay closer attention to their portfolio to meet the challenges introduced by new technologies and new entrants to the industry. This threat is manifested not only by the need to decrease time-to-market, but also the need to be able to redirect internal product development efforts as a response to unfolding market direction uncertainties. The interviewees expressed discontent with current PPM practices and that sufficient structural support was lacking. This has led the case company to launch two separate initiatives aimed at building in flexibility into the PPM, that started short before this thesis and are thus still ongoing.

One initiative was the introduction of strategic buckets (see subsection 4.2.2). The strategic buckets are used to earmark funds to specific development areas, thus linking project budgets to overall strategic direction via the distribution of money. The other initiative addresses the inhibiting effect of long budgeting cycles on portfolio size (see subsection 4.2.7). Instead of deciding on the number of projects every year by estimating the annual cost of the projects and fitting as many as possible into the yearly R&D budget, they have started to continuously track project spending in relation to budgets in order to see how many projects they actually can afford. This is designed to counter reliance on initial cost estimations in scoping up the portfolio for the year. As the results of these initiatives still are not apparent, their effectiveness is difficult to judge. Despite this, the interviewees generally view it as a welcomed improvement.

Below, the empirical data for each analytical theme is presented.

4.2.1 Formalization
The case company is a highly complex organization with a decentralized approach to PPM. This became evident when studying the large number of managerial meetings and how the outcome from these meetings is communicated vertically in the organization. Their PPM contains a lot of different actors with distributed responsibilities, without anyone coordinating between them. They do not have a PPMO and while collaboration exists, the methods are not standardized.

The case company is utilizing a classic stage gate model for their product development projects, with several decisions point that are in place to guide the project from the concept development phase (yellow phase) to the product development phase (green phase), depicted in Figure 9 below. For a project to go into the product development phase after a decision at DP4, all major product risks and uncertainties must be resolved. Configuration refers to a preparatory phase, where a small team estimates time and cost and plans for the development phases.

![Figure 9. The case company’s stage-gate model for developing new products.](image-url)
Before a new project is launched, it has to go through a project planning meeting where the project is appointed a project team and a project manager from the line organization, as well as a coach from the moderating department. The moderating department is responsible for all projects within the yellow phase and provides guidance and coaching throughout the project. This implies monitoring the current spending in the strategic buckets to ensure that the allocated budget is not exceeded, as well as surveilling projects that are either under- or overspending in relation to the budget.

The project manager from the line organization assigned at the project planning meeting remains the project manager until decision point five (DP5). When the project reaches this point, a project manager from the project organization is appointed and the responsibility of carrying out the project is transferred from the moderating department to the project department. Additionally, when the project passes decision point two (DP2), it is never terminated according to case company policy.

![Identification & Selection](image1.png)

![Product development](image2.png)

**Figure 10.** An illustration of how projects are identified and selected, before entering into the case company’s product development process. To understand the identification and selection process in-depth, see subsection 4.2.4.

Before a project can enter into the yellow phase, it has to be allocated to a strategic bucket. The reason for this is to align all projects with the organization’s long-term objectives. Every strategic bucket has a cross functional work group containing representatives from the R&D department as well as the marketing department (see Figure 11). The objective of the work group is to prioritize between different projects and to decide which project should be launched next. The work groups are guided by the moderating department, that participates in the decision-making process. All decisions provided by the work group and the moderating department later have to be approved by a steering committee. This steering committee consists of representatives from all departments and they are present at the company’s CQ (concept development meeting) and PQ (product development meeting) meetings. The steering committee’s objective is to take decisions related to the concept development process and the product development process to guarantee that the best projects have been selected. The CQ and PQ meetings are held regularly and are the highest instance of decision-making in the product development process. Information regarding projects is presented to the steering committee, which decides on changes to and the future of the projects. At this meeting, the steering committee either approves or rejects the recommendation. The moderating department also facilitates the prioritization process and together with the bucket’s work group, they create a time plan for the project and determine when it should be presented at the PQ/CQ meeting.

Occasionally, a project needs to be moved from one bucket to another. The reason is usually that the current bucket has reached its budget limit or that the bucket owner has chosen to proceed with more urgent projects. In this case, there is a meeting called the portfolio meeting. Here, the bucket owners decide upon which projects should be moved and whether the previous bucket’s allocated budget should
be moved along with the project. The portfolio meeting also serves as a forum to discuss where projects ideas without a strategic bucket should be allocated. If a project cannot be moved from one bucket to another, the working group can request that the allocated budget ought to be increased. In that case, a recommendation is brought to the steering committee that can verify the request before forwarding it to the strategic portfolio meeting (SPM). In this meeting, the heads of each sector are present and they are able to handle budget adjustment requests once a month. The sector heads are also responsible for deciding which strategic buckets ought to exist and how the distribution of the budget should be carried out. This decision is based on recommendations brought forward by the moderating department and the marketing department.

An illustration of the strategic buckets implementation can be seen in Figure 11 below.

![Figure 11. An illustration of how strategic buckets are utilized within the case company.](image)

As profitability in the automotive industry shifts from hardware to software, the case company has started to focus more on software development. This has also lead to the introduction of agile principles on the team level, which means moving from the traditional stability of long cycles and incremental improvements in the product development processes. The move toward agile methodologies was just settling in the organization at the time of this thesis, although they still hired agile consultants to help with the agile methodologies. Since this move takes place on the team level, the dynamics of the external environment makes the case company investigate ways to scale the agile way of working all the way up to the portfolio level in order to align the organization. Mainly Scaled Agile Framework (SAFe) is considered for this, but it is not yet implemented. There exists an ambition to become more agile within the case company, but as of now are they not agile outside of the team level.

When asked about eventual problems with the formalization, the interviewees mention that the responsibility distribution is unclear and there are difficulties in understanding who is in charge. He mentions that the moderating department has shared responsibility with the marketing department to facilitate the yellow process. However, it can be difficult for bucket owners to understand the power balance between themselves and the moderating department. The same interviewee adds that the case company at times introduces new formalization practices without having the adequate systems or knowledge in place. This has led to work groups within different buckets applying their own methods in order to perform certain tasks. For example, some work groups are well aware of their spending relative to their budgets, while others do not have the tools to acquire the same information.
4.2.2 Strategic Alignment

In order to improve their PPM, the case company has adopted strategic buckets. This is a way of coordinating projects of similar nature by allocating them to certain “buckets” with different NPD projects connected to the company’s overall strategy. It is way to align product development efforts with business strategy, which in turn is supposed to be subject to constant revision to ensure alignment with changing market requirements. Every bucket has an allocated budget which is distributed by top management and the occurrence of a specific bucket is motivated by circumstances in the external environment in relation to the company’s desired future market position. Thus, the strategic bucket is a representation of a company’s resource allocation on a macro level, unlike resource allocation on the micro level which concerns individual projects. In a way, every strategic bucket is a portfolio by itself, where projects are ranked and launched until all available resources are expended.

Every bucket has a bucket owner which primarily is responsible for prioritizing the projects allocated to the bucket, as well as facilitating necessary activities to complete the project. These activities may include requesting to increase the bucket budget to ensure that certain projects may be completed in time. Furthermore, the bucket owner is supported by a cross-functional work group aiding the bucket owner in their daily decisions. Lastly, a steering committee consisting of all department heads aids the bucket owner and work group by ensuring that decisions made are aligned with the company’s overall strategy. They have say in certain questions regarding the strategic direction of the buckets, but ultimate decisions are made at the SPM. This is where definitions and budgets are revised, as well as what buckets to have and during what time period is decided. In short, the strategic portfolio meeting is where alignment is supposed to be ensured. Additionally, all bucket owners participate in a joint meeting called a portfolio meeting, where eventual projects may be moved between buckets. At the case company, there are also product characteristic owners in charge of certain important features of the end products. These people also affect the direction of the buckets by rating projects according to their impact on the respective product characteristic.

At times, projects end up in a bucket where it is not helping toward the goal of that bucket and should be placed somewhere else. It is then brought up and discussed at the portfolio meeting, a meeting where bucket owners can share experiences and coordinate. Projects that are moved should be done so because they fit better with the goals and priorities of the other bucket, not because funds are available somewhere else.

At the case company, the strategic buckets are currently the main vehicle for aligning the portfolio with business strategy. They were created to partition the portfolio into manageable sub-portfolios and make sure projects were executed in all of the strategically important areas. Another benefit enjoyed is the possibility to discriminate the demand for returns between different buckets, leaving room for long term planning for projects that are not profitable today but are critical for the future. Currently, no structured approach for creating buckets exists, they are created as needed and range widely in content, from an individual project or technology to a whole program or an end product characteristic. There is also one bucket aside from these, where management to run certain projects that are additional to the rest of the R&D budget. This bucket is used for projects that are not coherent with any of the buckets, but still are strategically important.

Each bucket has a definition of what it should contain and what purpose it serves, in order to fulfil a certain aspect of the product strategy. Depending on the nature and maturity of the projects, the buckets contain differing ratios of concept development and product development projects. A portion of the R&D budget is allocated to the buckets, the size of which is supposed to reflect the overall strategy.
However, the definition and the budget, along with the implicit permeation of the overall business strategy, are the only directions the work groups in the buckets receive. In spite of this, the definition and budget of the buckets have proved helpful in aligning the portfolio with strategy. By constantly revising the definitions and budgets, the case company can update the strategic direction of the portfolio and a certain amount of control over the portfolio can thus be exercised. As an example, to emphasize the heightened importance of electrification, the “fuel economy” bucket was renamed to “energy efficiency”, which lead to a change in project content and in turn also the competencies represented in that bucket.

Most buckets are managed so that they follow roadmaps, in order to ensure that long term goals are achieved and that value is delivered to the customers by displaying what projects are going to be executed and over what time period. These goals are set on a higher organizational level with respect to strategic product introductions as well as the competition. The roadmaps are designed by cross-functional teams through identification of the product gaps between current and future state, and are approved by the bucket steering committee.

Some criticism over the strategic alignment has been raised, claiming that the bucket system is not enough. A more holistic approach is warranted, considering the best possible expenditure to achieve the overall business goals. Also, inside the buckets, strategic considerations are scarce as the work groups are mainly concerned with achieving the bucket goals rather than fulfilling a part of the overall business strategy. This means that work groups within buckets that are driven by short term financial goals not necessarily perform a holistic analysis of the strategic contribution of the different projects. When strategic alignment is not conducted centrally, the holistic view of the product strategic direction might be neglected without proper processes at the bucket level. This translates into a need to evaluate the available projects according to their strategic contribution.

4.2.3 Resource Allocation
At the case company, 2 types of resources are allocated in separate processes: people and money.

The allocation of people is done through a cost and resource estimation process. Due to the historic nature of the industry, the case company is structured around the functional areas of the department. This means that the resources are owned by the line organization and have to be requested by project managers. Thus, the cost and resource estimation process is initiated by the project managers sending out project descriptions to group managers. The group managers are then to provide information estimations on resource needs to execute the project and if those resources are available. Consequently, line managers have a say in how many resources are allocated to certain projects, which can create a bias toward projects they find important. The information from the line managers can then be used to draw up costs and reserve competencies for the projects. Accordingly, poor projects descriptions lead to poor resource need estimations and therefore meetings are held every 2 months to revisit these estimations. They also have plans to include representatives from the line organization in the product planning process to improve the quality of the estimations.

Once the people are estimated and the costs calculated, the allocation of money in terms of budgets can be made. About half of the R&D budget is reserved supporting activities that cannot be linked with individual projects, such as group meetings and process improvement. The rest of the budget is used for product development, and it is distributed across the strategic buckets. At the first level, the R&D budget is allocated to the concept development and product development processes to ensure spread
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over project in different stages of their life cycles. These budgets are then further decomposed to the second level buckets where the actual projects are managed.

Yearly, all projects are opened up for a re-planning of project budgets. The line organization can then provide feedback on deviations in actual demands from the prognosis, to serve as basis for re-allocation of resources. This could lead to redistribution of budgets and, if the changes are major, to instability in bucket planning and project execution. The work groups in the buckets however, can adjust their budgets on the strategic portfolio meetings that are held once a month and thus act within a different time frame.

**Resources and Project Phases**

The distribution of resources is decided at the strategic portfolio meeting and they are allocated for one project phase at a time, which means new resources have to be requested after each phase. The initial phases, during the concept development stage, do not require much resources and are handled outside the cost and resource estimation process. Not until the industrialization phases can somewhat accurate estimations be made. The estimations are not conducted before each decision point but at least at decision point 2 and 5 in order to assess project costs before the development phases as they are the most time and resource consuming.

Furthermore, there is a misalignment in the organization according to the interviewees. They mention that some projects are not put into perspective at the PQ/CQ meetings. One interviewee gave an example by mentioning that when projects are assigned fewer resources than initially agreed upon, the project manager is not consulted. The project manager has to adjust to the situation even if the amount of resources is key to the success of the project. However, projects are seldom re-evaluated in terms of scope. Another aspect adding to the misalignment problem is the yearly budget cycle. As the budget is determined on a yearly basis but projects are launched and prioritized on a monthly basis, it can be difficult to appropriately allocate resources when conditions are changing. The interviewees argue that this is difficult for the organization as resources are many times either under- or over utilized.

**Deviations**

Conditions for projects always change and if it means that costs go up, problems arise for the work groups in the buckets since they have already allocated all the bucket resources. If the budgets cannot be reconciled with project needs, the issue is escalated and prioritizations made. Projects do often under- or overspend, and even though opinions differ most interviewees agree that their prognoses need to improve. However, the project manager rarely knows how the projects are doing, as budget controlling is done at the bucket level. Every project has a project controller as well and this person can help provide information on the expenditure status. This is done once a month and at the same time they investigate whether more projects can fit inside the budget, which can happen if the discrepancy between the underspending and the budget is sufficiently large. By continuously follow up the actual spending against the budget and adding projects, the effect of poor prognoses can be somewhat diminished. In that case, a new cost and resource estimation is completed and projects can be started anywhere in annual budget cycle.

Overspending mostly depends on poor prognoses or changes to the scope that are not accounted for within the budget. Underspending can also be caused by these issues. However, underspending often also depends on resources (mainly people) being stuck in other projects and thus cannot be utilized in two projects simultaneously. Another problem leading to underspending is that the resources needed to carry out a specific project are often overestimated. This is a way of securing resources that might be
needed if the initial project prognosis is incorrect. Following from this, valuable projects are left untouched while they fail to spend the whole budget. Without spending the money, the bucket and overall goals cannot be achieved.

The case company is mainly deviation oriented when it comes to re-allocation of already distributed resources, meaning that they never make changes until projects start over-spending. Once resource decisions are made, it is often difficult to receive more resources without changing the scope, but if it does happen. In this case, the project manager escalates the project to a higher organizational instance to receive more resources or reduce the scope. Since the project management office make cost estimates for the whole project but budgets are determined on an annual basis, over-spending can also be offset chronologically and be deducted from the next budget, without changing the total for the project. The case company would like to budget for the whole project, but a new major shareholder wants them to budget for only one or two years in advance, a shift that is yet to be implemented. Despite this, the interviewees point out that even today there is too much focus on the budget of the current year. As it does not matter too much to the project when the money is spent, it clashes with the annual budget mindset of the line organization. The interviewees said that the bucket work groups would like to receive stable budgets for several years, instead of the annual focus of today. If the bucket budget is changed from one year to another, projects have to be re-planned, re-scoped or shut down. The disharmony between the time horizon for projects and budgets can lead to unfavorable timing of activities due to budget constraints and spending the money later than planned means fulfilling business goals later.

If projects underspend in relation to the budget, ideally the unspent resources should be returned to the system to be used somewhere else. According to the interviewees, this is rarely done, which is necessary for the flexibility of the resource allocation. Such a process could help balance out under- and over estimations by quickly redistributing resources, decreasing reliance on accurate prognoses and prioritization stability. This, together with the lack of system support for the line organization to see how much of and where their resources are allocated, makes it difficult to determine how much resources are available. As a consequence, man hours have sometimes been assigned to projects even though that there are no man hours available. The project quality can suffer if this leads to competencies being left unutilized in projects. Although, this does not have to be the case if the allocation of too much people stems from a reevaluation of workload and an additional project can be executed. On the other hand, the situation should be dealt with by writing down the required hours on existing projects rather than over-allocating, making resources appear scarcer than they are.

Changes and Re-allocation
The case company has a process for making changes, whereby it is possible to escalate deviations. It is however not used frequently enough, despite their realization that accurate resource inventories are important to PPM as it dictates which and when projects can be started. This requires clear process definitions on what and when information should be logged into the system. Decisions need to be made based on accurate information, which in turn means changes need to be entered into the systems. Primarily the return of resources that are not needed was highlighted as an important aspect. At the case company, they were not accustomed to this, making it difficult to follow up on the budget and reevaluate decisions in order to make changes.

Aside from changes inside the buckets leading to the redistribution of the bucket budget, projects are also sometimes moved between buckets. As the implementation of strategic buckets is relatively recent, the process for moving projects between buckets has not settled. The question of resources is often raised and whether or not they should follow the projects to the new buckets. Since the budgets allocated
to buckets are strategically determined, a budget move would be disrupting to the strategic alignment. On the other hand, a new project introduced to a bucket with an exhausted budget, would steal resources from other projects designed to fulfil the goals of that bucket. Usually, the budget is also transferred at the case company.

As of today, efficient control over the resources is lacking, meaning that the ability to redirect resources according to changing requirements and prioritizations is poor. A move toward continuously following up on the spending in all buckets has been initiated, with the purpose of improving the flexibility and allowing for decisions regarding resource allocation to be made and re-made throughout the year. Although the new processes were not in place, it was seen as an improvement to today’s annual cycles. The idea is to also implement shorter budget rounds, allowing for incremental adaptations to be made often. However, due to the complexity of the end product, startup times related to frequent changes in the allocation of people could drive costs. This should be taken into consideration and be balanced against the value of flexibility in the resource base.

4.2.4 Identification & Selection

Before projects can be evaluated and selected, they need to be identified. For the case company, this process involved gathering ideas from different parts of the organization, such as the line organization and the work groups within the strategic buckets. The product development team also contribute with ideas by analyzing the desired strategical state in the future and suggesting project ideas that are in accordance with reaching that state. Furthermore, it is possible to collect ideas from the company’s so-called budget round. Once a year, the case company makes all projects available for change in terms of resources and new ideas are collected throughout the organization.

When all ideas have been collected, they are evaluated at the project portfolio meeting where representatives from all departments are present. The ideas have to be assigned to a strategic bucket in order to advance to the next phase. This makes it easier to understand the greater strategic purpose the project will fulfill and it also puts projects into perspective, as different strategic buckets exhibit different criteria for project evaluation. For example, a project exhibiting a high net present value might still be considered inadequate when compared to the evaluation criteria in that bucket. The strategic buckets also have different budgets allocated to them which dictates which projects are selected. The strategic bucket’s work group usually have a backlog with projects that are interesting to bring up at the project portfolio meeting, when the bucket’s budget and the window of opportunity allows for it. Before a project reaches the next phase, the project needs to be adhered with a resource estimation.

When potential projects have been identified and the resource need is estimated, a selection process takes place within the project portfolio meeting. The objective with this process is to assess the need for a specific project by investigating the current market conditions and also looking at the different financial metrics of the project. Generally, these metrics are net present value and customer financial benefit. This means that the case company investigates what financial gains can be obtained from a potential project and what the expected customer benefit in terms of money is. The financial metrics are presented at the cross-functional CQ meeting, where different functions within the case company are represented. If the project is approved, it goes through several decision points which serve to eliminate potential risks with the project.

The interviewees bring forward that the case company spends too much time performing rigorous analysis in the early stages of the project. Because certain conditions such as risk and financial gain will most likely change during the project life cycle, the initial analysis most likely will become obsolete.
One interviewee argues that it is better to have a cruder way of assessing projects in the beginning and continuously following up on eventual deviations. Moreover, the focus in assessing projects should not lie on the absolute value of the financial criteria, instead it should lie in comparing the project against each other and understand how they relate to the portfolio as a whole. The interviewee states that this is more important for strategic alignment than just identifying the project with the highest NPV value in each bucket.

### 4.2.5 Prioritization

Two levels of prioritization were identified at the case company. First, an implicit prioritization on the corporate level is done through the allocation of budgets to different strategic buckets. This allows management to concentrate investments to areas of importance and priority to the overall success of the business. Although the implementation of explicit top-level prioritization has been discussed, the case company decided that projects in different buckets are best not compared. Second, a prioritization was made between the projects in each separate bucket. This is done by the cross-functional bucket work group and then approved by the bucket steering committee. The top projects that can fit into the bucket budget are then executed, while the rest are put on hold. Thus, when the budget is filled and the projects have started, their relative prioritization becomes irrelevant and are all executed indiscriminately. Projects outside the budget are discarded or put on hold and reevaluated once additional funds are secured.

The work groups within the strategic buckets have different approaches to prioritization, depending on their contents and aims. The unique goal and description of every bucket, along with the overall business strategy, forms a basis for adapted prioritization models in the respective buckets. Buckets with strategic, long-term and more radical innovation directions tend to prioritize according to competence building roadmaps of technological evolution. These are not so concerned with financial contribution from the projects based on today’s market requirements, but rather the preparation for future market needs. One owner of such a bucket highlighted that some projects that are strategically important would be difficult to prioritize highly enough to be executed without the bucket system, due to their low financial contribution.

On the other hand, buckets containing short-term, incremental innovation projects tend to rely on weighted scorecards. The work group utilizes these scorecards to rank and evaluate certain criteria of the project. As there is no standard scorecard employed across buckets at the case company, each work group has constructed their own. An interviewed bucket owner had four categories weighted equally to score different projects: financial value for case company, financial value for customers, effect on product characteristics and a manual input. The process to score projects involves several people, including representatives from market, R&D and product characteristic owners. The financial values, both for the case company and its customers, are calculated using NPV-methods. The effect on product characteristics, as opposed to the financial values, is comprised of several sub-categories to assess project attractiveness, including impact on product attributes (such as load carrying capacity), sustainability and if it is a premium feature. These three categories result in a project score, which is then modified by a manual input. Interestingly, this manual input is often given a score about 50 times that of the calculated score, effectively overriding the calculated output of the three first categories. This override is supposed to account for project coherence, timing and external factors. It is not entirely apparent, known or formalized how this input is sized, but it is obvious that it is significant to project prioritization. It is considered valuable to still use the scorecard since it provides overview of the different facets of projects evaluation and is as such used primarily as a basis for discussions.
Once a project has been prioritized and started in the product development phase, case company policy dictates that it is supposed to remain prioritized and executed until completion. In other words, the case company does not stop any product projects that has received significant investments. This means they rarely stop one project to start another, even if there is a strong business case for it and they also have problems pausing projects. This is due to ineffective re-allocation of resources according to the interviewees.

Some perceive this no-kill policy as something positive, since it provides stability and that the project might just as well be finished as it has gotten so far along. These people think projects only should be stopped if something has happened, and not because of changing priorities. Others see it as a main obstacle to becoming more responsive and would like to see the prior investments as sunk costs. Admittingly, it would be painful to stop a project to start another, but it can be viewed as a requirement for a flexible PPM. It is possible to kill a project at a late stage at the case company, a lost business case is mentioned as an example, but preferably it is done as early as possible to avoid investing in futile projects. Some projects were described as white elephants, whose riddance was considered a necessity and therefore in conflict with the policy.

### 4.2.6 Communication & Decision-making

The main tool the departments have at the case company to communicate is their “pulse” meeting structure, illustrated in Figure 12 below. It is possible to observe how information spreads from the highest level, where all sub- and sector heads and project managers are represented (main meeting), to the section heads and their groups from the bottom level in the hierarchy, and then back up again. This is iterated every week, allowing information to permeate all levels of the organization.

![Meeting structure for the pulse at different departments at the case company.](image)

Two meetings are conducted with the section heads and groups, with a few days apart. The first meeting is where the section head informs the group members about what has been brought up at the main meeting to discuss how the group should act on the information. The second meeting is where the group provides the section head with questions and issues to bring forward to the sub-sector head, who subsequently brings it up at the main meeting. By observing the second meeting, we found that this
discussion mainly revolves around the notes taken by the sub-sector head from the main meeting. Furthermore, it seemed as if the focus was not to question any decision. Instead, employees were more focused on discussing eventual problems that they were experiencing with their daily tasks.

When the information from the groups is brought forward to the main meeting, it is done so in a structured manner. Before the sub-sector head is able to present the group’s inquiries, the project managers are able to present how their current projects are affecting different departments and whether they need more assistance from others in order to proceed. The status of the project is assessed through different aspects, such as cost and time. When the project managers have finished their presentations, the sub-sector heads can continue. This is the opportunity for the sub-sector heads to ask for more resources and also present eventual questions that the group has posed to other departments.

Additionally, the case company has a controlling function, supporting all projects in the green phase by planning and monitoring different activities within the project. However, one project manager argues that the case company does not oversee the projects and compare them to see whether they are currently aligned with the performance and time requirements which were determined before the project was launched. The same interviewee adds the project outcome is not compared with the prognosis and that it would be beneficial to change the scope of some projects when there is a reason to do so. The interviewee continues by mentioning that there can also sometimes be friction between the project managers and the bucket owners. This is because bucket owners pose reporting requirements upon the project managers that they do not believe is within their responsibilities to fulfill. These requirements include things as cost development reporting and many times it can be difficult for the project manager to understand why certain information is of importance. Having these reporting requirements is, according to a project manager, not something that the project manager should be obligated to comply. However, the project manager complies in many cases anyway, as it is unclear who is in charge.

Occasionally, the work groups in the buckets can experience difficulties with keeping their spending within the budget. In these cases the bucket owner might demand cost cutting measures from the project manager. This is also difficult for the project managers as they have made a time plan for the project where some resources are key to the success of the project.

However, it is important for project managers to report their cost development. The interviewees mention that this is a key activity in order to correctly plan the available resources. In this case, the line organization has the ability to inform the project manager that additional resources are needed. The project manager can then put together relevant information to answer why more resources are needed, which they can present at the CQ/PQ meeting in order to expand the current project budget. This reporting is currently dependent on the project manager and there exists no system to guarantee this process. However, it is not that common that the project manager asks for less resources, as there is often a need to secure those resources as a buffer. Furthermore, it might be difficult to increase the budget in the future, as the case company’s controlling department has started focusing more on project economy as a result of pressure from external shareholders.

### 4.2.7 Number of Projects

The number of active product development projects at the case company depends solely on the size of the budget. Each strategic bucket is allocated a budget which are to cover the costs of the projects. The bucket’s work group makes a prioritized list of the candidate projects and draws a line where the budget runs out. The suggested portfolio is then presented to a bucket steering committee for approval before being accepted as the set of projects for the coming year. Project candidates that are considered
favorable, but do not fit inside the budget are left outside the portfolio and are put on hold. The approach works well under ideal conditions, but when changes need to be made in the middle of a cycle or resource estimations are significantly incorrect, the annual portfolio sizing becomes too inflexible.

As mentioned in the introduction of section 4.2, the case company has launched an initiative to counter these problems. By continuously evaluating portfolio size in relation to actual project spending, they can instantly determine how much of the budget that is available, instead of discovering at the end of the year that money that could have been used for funding projects was left untouched. The new approach also provides information support to examine if changes can be made in the middle of a budgeting life cycle, such as re-prioritization or bucket budget adjustments. In the increasingly turbulent environment, regular strategic modifications could thus ripple down to affect the number of projects. Although the processes and data were not available to fully accommodate for this initiative yet, the people at the case company had started to think about continuous reviews of the portfolio and exhibited a positive posture toward it. By reevaluating the number of projects constantly, it was deemed possible to include the number of projects that actually fits the budget, instead of what is estimated to fit in the beginning of each year.

4.2.8 Balance
Achieving portfolio balance was not in focus at the case company, as it quickly became apparent that deliberate efforts to strive for a suitable mix were next to non-existent. That said, some implicit mechanisms contributed toward balancing the portfolio. The strategic buckets provide a structure for spending across different technological areas, which in effect creates a mix between incremental and radical innovation projects. This also means simultaneously mixing projects that are financially favorable with projects that are strategically important, which can balance cash flows from projects by distributing their expected revenues over time. Also, since the buckets are not arranged after project life cycle, each bucket contains projects from the concept and the product development phases. This means that there is a mix to at least some degree regarding time horizon and risk. Even though individual projects conduct risk analyses, there is no processes to ensure appropriate risk appetite for the portfolio at large.

As mentioned, these efforts do not explicitly or deliberately regulate the balance of the portfolio. Currently, even a relative assessment of project characteristics is lacking. The case company does not consider projects in relation to the rest of the portfolio, or to new candidates, but evaluate them instead solely on their absolute financial contribution, making it difficult to actively balance the portfolio. The interviewees state that as of now, they are not adequate in creating a balance, but that they are just learning to evaluate projects relatively and not just in terms of profitability. Today, discussions on balance commonly focus on project contributions and resource demands. Following roadmaps, the case company rather targets projects that enable timely delivery to customers.

4.2.9 Cultural Alignment
When asked about cultural alignment at the case company, the interviewees brought forward that projects that go through the process of identification and selection, and which ultimately are selected to be executed, are never terminated beyond the introduction into the product development phase. The case company has a culture where once a project is started, all actions should be taken in order to remove potential risks from the project so that the industrialization phase may commence without complications. Furthermore, terminating a project would send a “bad signal” to the rest of the company. When asked if it would be better to terminate some projects in favor of starting more lucrative ones, it was mentioned that extraordinary circumstances would have to be present in order for that to happen.
It was argued that when a project is decided to commence, the point where the project becomes lucrative only comes closer and closer. Therefore, it would not be wise to delay the point in time where the project starts becoming lucrative. Consequently, this affects the PPM as more profitable projects might not be considered. If the organization is determined to complete all selected projects, there is no room to consider changes in the external environment which might affect the decision concerning which project is best to commence at a specific point in time.

On the question on how knowledge is transferred and retained in the organization in terms of PPM, it was argued that the company is decent. Continuous improvement was brought forward as a fundamental value within the company and all employees are part of improvement groups where the purpose is to share knowledge and expertise with other departments. Furthermore, there is room for improvement and the interviewees also suggested that more time should be spent on creating structures and processes for organizational learning. This is however difficult, as a single person or group is not responsible for the portfolio management. The interviewees mention that a significant part of the company’s organizational learning is constituted by the meetings conducted between the owners of the strategic buckets. These owners are the operational managers of the strategic buckets and have a significant saying in the daily activities that concern the projects within the bucket. On a regular basis, all bucket owners conduct a meeting where they share their experiences from previous projects, in order to help each other handle ongoing or upcoming challenges within their buckets.

The same interviewee highlighted one initiative which the interviewee took part in, as member of a bigger cross functional group. The aim of this initiative was to understand how the PPM process was structured today and determine which steps the organization should undertake to improve its PPM. One finding from the project was that the organization had to be made more transparent and that right information needed to presented at the right time. Furthermore, the ability to connect dependencies and available resources was also found to be of significant importance when attempting to reach the organization’s long-term objectives. This interviewee also told about another previous attempt at analyzing and improving the PPM processes at the case company. However, the results of neither attempt were presented to management, let alone implemented, and were ultimately abandoned.

### 4.3 Survey Results

After the second round of interviews was completed, a survey was distributed to the same interviewees that participated in the first and second round interviews, as well as their associates who had similar functions as them. There were in total 12 respondents to the survey and their answers can be observed below.

**PPM Themes - Importance and Performance**

When respondents were asked to rank the most important PPM themes as well as the PPM themes they believe they perform best in, the result displayed in Figure 13 was had.
Current PPM Satisfaction and its Effect on Company Success

When respondents were asked to rank their satisfaction of the current PPM processes as well as how they affect the company’s success, the result seen in Figure 14 was observed.

The respondents were asked to motivate their ranking on PPM satisfaction. Some did so by arguing that the project prioritization is insufficient and that there is a lack of communication outside of the R&D department. Another respondent adds that the prioritization and the way of conducting the PPM process is mainly done through a cost perspective. Only a few other performance metrics are used when launching and prioritizing new project. It would be more beneficial to constantly investigate the customer needs and try to choose projects that fit best with that.
Furthermore, a subject that was mentioned frequently was budget. A major contributor to the low PPM satisfaction was that there were not sufficient resources in some instances which complicated the work considerably. One respondent mentions that the budget for his bucket was reduced, even though it was communicated from management that the projects conducted within his bucket were key activities for the success of the company. Ultimately, respondents perceived that the budget process and the decision process behind it could be improved.

**Main PPM Challenges**

When asked about the main challenges that the case company faces with their PPM in order to have a competitive market position, the respondents wanted to see a more carefully constructed project prioritization process. One respondent argued that choosing the project which deliver maximal customer value and which the company is able to deliver in time should always be the number one priority. To achieve this, there needs to be a better connection between project planning and the available resources.

Several responds believe that the best way to improve the current PPM practice is by focusing on new technology and find new ways to be more flexible with their resources in order to handle changes in the external environment. The respondents stress that project prognoses have to improve in order to make the resources more flexible. It was suggested that the organization applies one or several PPM tools in the entire organization to make this happen. Currently, there are tools available but they are not being utilized properly. Additionally, prognoses need to be adjusted whenever a new major decision is taken within the project. By utilizing these tools, the organization might be able to reach a better control of their resources and it might facilitate collaborations with external shareholders, which is becoming increasingly important in the organization.

Furthermore, several respondents state that too many projects are executed simultaneously. These respondents believe that the organization should risk neglecting certain activities that might not be the best for the organization’s long-term objectives. There needs to be a clear understanding of the portfolio content and purpose throughout the whole organization. If there is resistance to the strategy, it will be impossible for the organization to develop new products and services in the rate which is demanded of them. Lastly, There also needs to be a clear balance between the budget allocation for the strategic buckets. However, there needs to be room for change as the external environment is continuously changing.

**Ability to Handle External Changes**

When asked how suitable the company is to handle external changes such as new technology and new competitors, some respondents answered that the PPM process is adapted to outdated technology that is not relevant anymore. There seems to be a lack of flexibility in the development. Many projects have long cycle times, measured from when the top management approves a technology until it is industrialized. The majority of the respondents agree with this, but they also add that the organization is well fitted to successfully make the transition to a more flexible PPM process. This is due to the company’s ability to deliver high customer value and a majority of the respondents believe that when the PPM process is updated, it will allow the organization to deliver even more customer value at a faster rate. Delivering at a faster rate was expressed as being a key activity in the future, as new players are entering the automotive industry that have significantly shorter lead times.
5 Discussion

This chapter covers the discussion on the findings from the case study in relation to the literature. The PPM performance and the APPM importance and performance is discussed. Last, considerations when becoming agile are outlined.

Following from the literature review and the empirical data, a discussion on the PPM and APPM performance can be had to find main challenges. A summary of the discussion can be seen in Table 5 below.

<table>
<thead>
<tr>
<th>Analytical Themes</th>
<th>PPM performance</th>
<th>APPM importance</th>
<th>APPM performance</th>
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</thead>
<tbody>
<tr>
<td>Formalization</td>
<td>▼</td>
<td>▲</td>
<td>▼</td>
</tr>
<tr>
<td>Strategic Alignment</td>
<td>▲</td>
<td>▲</td>
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<tr>
<td>Resource Allocation</td>
<td>▲</td>
<td>▲</td>
<td>▼</td>
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<tr>
<td>Identification &amp; Selection</td>
<td>▲</td>
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<tr>
<td>Prioritization</td>
<td>▲</td>
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<tr>
<td>Communication &amp; Decision-making</td>
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<td>Balance</td>
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<td>Cultural Alignment</td>
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Table 5. Overview of findings displaying the performance and importance of the analytical themes at the case company, categorized as low (red), moderate (yellow) and high (green).

5.1 PPM and APPM - Importance, Performance and Challenges at the Case Company

PPM performance refers to how well the case company performs in their PPM. This is based on a comparison between the processes at the case company and the existing knowledge on PPM that can be found in the literature. Since all the themes of PPM are derived from the literature, they are all deemed as highly important to PPM and will thus all be covered below.

It is clear from the literature that legacy PPM inherently possesses flexibility (for example when viewed as a dynamic capability by Teece et al. (1999)). What is not clear, however, is whether this flexibility is enough to deal with external turbulence or whether APPM is needed. The emergence of the APPM research and practitioner framework seem to suggest that it is needed, but that can possibly be a response to the need for organizational alignment with agile practices on team levels or just a ripple from the wave of popularity agile methodologies have experienced lately. What we have concluded is that APPM is needed, mainly because the time frame legacy PPM acts on exceeds that of which changes occur in the environment. Another point of APPM is that it provides benefits in other areas than just the
processes, as a philosophy it can help transform organizations and people to better face turbulence. In extension, this also means that the research on APPM is needed.

Generally, APPM seeks to balance the flexibility of agile with the stability of PPM. It is a fine line and it is not drawn clearly in the literature. One common way of embracing both flexibility and stability this is through stability in increments, giving absolute stability but for a shorter time frame than practiced in legacy PPM. This means operations can rely on decisions made regarding resources, prioritizations and processes during an iteration, but have to be ready for change in between them.

Although a holistic approach to APPM is warranted (Kettunen & Laanti, 2008), not all facets are given equal importance. Both in literature and at the case company, we found that certain analytical themes required more agility more than others. Thus, we have made a distinction between themes that truly need to be agile (high importance) and those that merely need a restructuring during the transformation to agile, but then are left fairly stable (moderate importance).

Below, the themes within the analytical framework are covered in regards to their importance and performance for PPM and APPM. Furthermore, eventual challenges faced by the case company are outlined.

5.1.1 Formalization

The case company’s ranking of themselves resulted in a low formalization score, both when ranking current performance and also the importance of formalization. Even though the case company has structures such as strategic buckets and cross functional selection meetings, these structures are many times uncoordinated and under-utilized. Therefore, the case company was assessed as low-performing in formalization concerning legacy PPM.

Strategic buckets and a specific stage-gate model are the functions which speak for high performing formalization. However, it appears that the case company fails in their attempt to properly establish routines and rules to support these structures. The strategic buckets offer a formalized structure enabling the case company to align projects with long-term objectives, but there is no clear connection between the portfolio- and project level. Additionally, there is no clear structure to handle deviations related to time and cost which might occur throughout the project. These deviations are therefore only reported when the action is instigated by a project manager. In order to significantly improve the portfolio success, both levels need to be formalized (Teller et al., 2012) and interdependent in a way which allow for more formalized PPM methods.

One major contributor to the disconnection between the portfolio- and project level is the absence of distinct roles. Thus, it is unclear who is in charge and there is no centralized function able to facilitate the exchange of information. In order to standardize and more easily coordinate PPM activates, a portfolio management office (PPMO) could be implemented in the case company (Killen & Hunt, 2013) in order to facilitate portfolio success (Jonas et al., 2013). The PPMO could be the function responsible for handling related PPM information and also be the function providing concerned parties with information that will facilitate the PPM. This would allow for more formalized communication channels and different working methods which can be observed across different buckets. Moreover, it would clarify the responsibilities and the hierarchies within the PPM process.

The absence of distinct roles can especially be observed throughout the prioritization process. However, it is of importance to have a shared approach on PPM activities (Archer & Ghasemzadeh, 1999; Cooper et al., 1999, 2001; Coulon et al., 2009) and a way of doing so could be by utilizing a standardized
scorecard. This scorecard could be used to assess projects’ strategic alignment, contribution to competitive advantage, market attractiveness, leverage of internal competencies, likelihood of technological success and financial benefit (Levine, 2005).

When considering the effect which formalization has on APPM, formalization was assessed as being of moderate importance. This is because a formalization restructuring is only necessary once, during the transformation period. Afterward, standards are supposed to be in place and stable to support other agile processes. Even though the case company has several processes for project management and product development, processes was lacking for portfolio management. Methods and tools were not standardized across buckets and, most prominently, a PPMO was lacking to coordinate PPM activities. This would serve to distribute power and encourage working in teams at the portfolio level (Steindl, 2005). A common way of working becomes increasingly important in APPM as responsibilities are distributed and dependencies increases between teams (Kalliney, 2009). SAFe provides a structured approach to APPM, where roles and processes are clearly defined. These roles and processes can act as a benchmark to organizations looking to implement APPM (Scaled Agile Inc, 2016). Perhaps most prominent is the synchronization of sprints to time frequent feedback, integration and releases.

5.1.2 Strategic Alignment

Due to the structured processes related to the strategic buckets, the strategic alignment function was assessed as being high performing in relation to legacy PPM. Furthermore, strategic alignment was considered being the best performed function by the case company itself and a major reason behind this may be the formalized structures which exist to align projects with the overall strategy.

Strategic buckets offer a way to promote innovation (Barczak et al., 2009) and increase business performance (Kahn, 2013). For the case company, this becomes evident as the structure facilitated by the strategic buckets offers top-management the opportunity to create innovative technology paths apparent throughout the entire organization. By utilizing strategic buckets in the strategic management process, the case company is able to align their project portfolio with their strategy (Meskendahl, 2010), which is generally done by utilizing selection guidelines when selecting new projects (Artoo & Dietrich, 2004; Cooper et al., 2001; Crawford et al., 2006; Dye & Pennypacker, 1999; Englund & Graham, 1999). Additionally, the strategic buckets are continuously revised in terms of their definition and budget, which allows the case company to update the strategic direction of the portfolio.

However, the case company is lacking in terms of altering their strategic alignment to fit with the current environment. There is a heavy reliance on incremental innovation as it lies in the company’s interest to keep developing their core competencies. However, organization flexibility becomes more important when changes occur in the external environment, as is the case of the automotive industry (Dreyer & Grønhaug, 2004). Judging by the changing environment of today, it would lie in case company’s interest to be more flexible with their strategic buckets in terms of innovation. As Cordes and Stugbäck (2016) suggest, the portfolio could contain more innovative projects during turbulent times, and more incremental projects during stable times. Additionally, a significant selection criterion when selecting new projects is financial metrics. This implies that the portfolio level is often disregarded and instead the biggest focus is to determine a project’s profitability and as quick as possible allocate it to a specific bucket where further action can be taken. It would instead be favorable to emphasize additional selection criterion with a bigger focus on strategy (Cooper et al., 1999). These criteria could then be adhered to the project and be continuously revised within the bucket.
Even though aligning project objective with strategy is important (Jonas et al., 2013), it needs to be done in a more holistic manner than the strategic buckets currently offer. The work groups are only concerned with managing project within the bucket and there is no consideration that takes the whole portfolio into account. Therefore, changes that might occur in projects are not revised in a manner which takes the overall portfolio risk into account. At all times, there needs to be a clear understanding of the portfolio’s content and purpose in order to guarantee that all current efforts are strategically aligned. This is the only way to handle changes in the external environment in a rate that is demanded of the case company.

Stettina and Hörz (2015) ascertain that strategizing constitutes a key group of activities in APPM and we consider it to be of high importance. Achieving strategic alignment is especially difficult in APPM. This depend to a large degree on the fact the strategic direction of work items and increments are difficult to assess in relation to the overall strategy. However, when successful, it is viewed as one of the main benefits of APPM. According to literature, it is often achieved through the use of dynamic roadmaps and single strategic portfolio backlogs.

Strategic alignment at the case company was judged to be performing moderately well in terms of APPM, due to the strategic buckets, along with their budgets and definitions, that were used to ensure strategic alignment. Strategic buckets are included in legacy PPM and can be used in stable environments, but for them to be contribute to agility they should be reevaluated constantly to reflect external changes. This is something we observed at the case company, not only were they flexible in terms of bucket budget, but also in terms of definition and content. The adjustments made to bucket efforts and goals allows for operational pursuit of strategic goals. The case company also utilizes roadmaps in their product planning, although they do not update them continuously. Once again, the frequently recurring routines that contribute to the value of the agile philosophy need to be applied to make sure strategic direction always is in line with the market.

On the negative side, the case company does not employ central portfolio backlogs, where project teams can pull work items from, this approach clashes with the newly introduced bucket structure. This diminishes transparency and thus team empowerment. Even though the case company uses teams in their project execution, the resources are owned by the line organization and the teams are not kept stable. This makes it difficult to combine a bucket approach with a centralized backlog. However, for the sake of transparency and cross-team collaboration, a central backlog can still be updated. Collaboration between teams is regarded as a difficulty in APPM and as strategic efforts cannot be broken down without dependencies, anything that can foster interactions between teams and clarify information should at least be considered. SAFe is based on the break-down of a portfolio backlog to create team-level work items, which can be used to combine buckets with central backlogs. Instead of teams pulling work items from a portfolio backlog, these are broken down and distributed centrally to buckets in the first step and then pulled from a bucket level backlog. This would mean initiatives are generated and kept on the portfolio level, rather than a buckets level. The resulting backlog need then be managed by a dedicated work group, a PPMO. The PPMO will then have the responsibility to make sure high-level work items are then broken down and distributed.

5.1.3 Resource Allocation
The resource allocation process was determined to be high performing in terms of legacy PPM. This ranking is mainly based on the strategic buckets and the formalization processes which these bring to resource allocation. As the bucket’s budget constitutes available resources, every bucket owner is aware of how many resources are available to carry out projects at a specific point in time. However, the line
organization owns the human resources, which are allocated in different phases. The case company upholds this process as a way of handling divergent prognoses. Furthermore, the annual budget round makes it possible to revise resource allocations and also handles eventual deviations from prognoses. By regularly re-allocating resources, the company is able to meet the demands of a changing environment and to accommodate for project additions (Petit, 2012).

However, even though there exists a solid formalized way of conducting resource allocation, it is not always dynamic. As the line organization owns the resources, there is already an in-built bias which will favor the projects that the line managers prefer (Beringer et al., 2012). And as project managers need to ask for resources, it can be hard to change the need once resources have been allocated. That is why many project managers ask for too much resources, in order to handle eventual deviations that might occur during the course of the project. In many cases, this leads to work groups underspending within their buckets, as they are not using all their resources. Meanwhile, those resources are seldom returned and cannot therefore be allocated to other projects or buckets. Consequently, poor project prognoses are part of the problem and the case company simply struggles with allocating the right amount of resources to a certain project as there is a lack of organizational learning adhered to the resource allocation process. Capacity analysis should be facilitated by keeping inventory on what resources are at hand at any given time (Levine, 2005). The case company has processes for adjusting resources but they are currently not being properly utilized. This needs to improve so that projects can be assessed more frequently and if resource requirements change, the allocation throughout the portfolio has to follow (Engwall & Jerbrant, 2003).

Instead of properly adjusting resources which are needed at a specific point in time, the company is deviation oriented and re-allocation of resources only becomes relevant if the work group in a bucket is significantly overspending. The case company should focus on constant re-allocation (Petit, 2012) in order to increase flexibility and organizational responsiveness (Killen & Hunt, 2013). One suggested way is to budget for several years ahead and use methods such as beyond budgeting to iteratively adjust prognoses. This would reduce the focus on the current year’s budget and projects timelines would not disharmonize with the budget time span. Furthermore, it could create a more aware resource allocation process which would prepare the organization further in the context of a changing environment (Elonen & Artto, 2003).

In APPM, resource allocation is one of the most important aspects since the spending and efforts of the business always need to reflect market requirements. Stettina and Hörz (2015) mention allocation of resources as a key activity in APPM, something highlighted as a challenge by the survey respondents as well. In practice, it is difficult to master, mainly due to the inflexibility of people making them difficult to re-allocate freely, constrained by competence, motivation, preference or time. Budgets are easier to redistribute. Even though the case company has a system to facilitate available resources, we found that the performance in terms of APPM is still quite low. The case company does make decisions and allocate resources for only one project phase at a time, preventing resources to be locked up for whole projects. On the other hand, some of these phases can last several years and as they have a policy not to kill projects in the development phase, resource agility is limited. Since project spending and budgets are not tracked continuously it also becomes difficult to evaluate whether the resources spent according to business needs. It should not only be evaluated in case of spending deviations. Furthermore, because actual spending will always differ from prognoses and changes need to be made, it is important to exercise transparency in resource allocation and spending so budgets can be re-allocated. At the case company, it is difficult receive more funds as the project develops, which is understandable due to overall budget constraints. However, this leads to overestimations of resources,
that then are not returned. They have a process for making changes and returning resources, but it is rarely used. If unutilized resources were returned when they are not needed, they can be re-allocated and used somewhere else. This is the first step toward re-allocation of resources according to business prioritizations, which is needed for resource agility.

5.1.4 Identification & Selection

According to the survey, identification and selection was among the legacy PPM functions the case company performed the best and also the function perceived as being of significant importance. Studying the empiricism in this thesis, it is possible to concur with the company’s high score of themselves and it leads to the conclusion that identification and selection is being performed on a high level in terms of legacy PPM. A critical reason behind this conclusion is the company’s identification and selection process. The company successfully avoids biased decisions in their selection process by relying on inter-functional selection meetings where representatives from all parts of the company are present. Therefore, it is possible to remove decisions based on emotion and power, as mentioned by Cooper et al. (2001) and Levine (2005).

Furthermore, the company has the ability to successfully align project selection with their strategy, according to the survey. The stated reasons were the strategic buckets which have been implemented in order to facilitate the process of strategy alignment. However, it is not sufficient to just allocate a project to a strategic bucket, the criteria used to select a project will play a significant role in the strategic alignment of the project.

There are however some contradictions that were brought forward by multiple interviewees. The biggest concern was that projects that were chosen were in fact not strategically aligned with the organization’s long-term goals. The reason for this could be that new projects were never compared to existing ones already present in the portfolio and that financial metrics are heavily relied upon when selecting new projects. Therefore, it might be favorable to broaden the selection criteria to include aspects beyond financial metrics. Furthermore, relying heavily on financial metrics leads to a situation where available resources are not being considered (Cooper et al., 2000). For the case company, resource estimations for each project were performed, but there existed no structured system for handling projects that did not fit within the budget. Additionally, the case company was reluctant to terminate ongoing projects. The given reason was that projects which are not terminated will have shorter time until they start generating income. This is however not a beneficial approach when considering number of projects and the ability to faster respond to changes in the environment. A way to solve these problems could be by using a forced ranking method where projects are killed or put on hold when resources are insufficient (ibid.).

Furthermore, the case company spends significant time on making accurate prognoses in the beginning of a new project. These prognoses are often based on criteria which will most likely change in the future and it would be more beneficial for the company if an evaluation could take place on an ongoing basis. Perhaps, this would lead to a portfolio which reflects the project’s current risk profile, as mentioned by (Engwall & Jerbrant 2003).

In terms of what importance identification and selection poses in the realm of APPM, we regard it has highly important. This is due to Stettina and Hörz (2015) arguing that identifying and funneling projects into the portfolio is one of the key activities observed for APPM. The case company has well-functioning legacy PPM practices but lack some aspects to make it agile. They frequently take in new project ideas, so the iteration loop of finding projects is relatively short, a prerequisite for making quick
changes to portfolio content. However, we agree with the interviewees that the case company overrelied on financial measures in project evaluation. This can cause problems when trying to adapt to the environment through strategic direction and risk management. Maximizing the short term financial value of projects does not necessarily maximize the long-term value of the portfolio. Furthermore, the selection of projects does not consider the projects already in the portfolio. The initial project assessment is then not followed up regularly as the project progresses through the development phases. This means that projects are not evaluated proactively once they are started and that the portfolio may not contain the right projects as changes occur. Continuous reviews and feedback is central in APPM (ibid.). This also means that it is difficult to learn about project evolution, hindering accurate prognoses and evaluation.

5.1.5 Prioritization

In the case of legacy PPM prioritization, the case company was perceived as being moderately performing. The biggest factor working in favor of the prioritization process is the presence of strategic buckets. These buckets offer an opportunity to distribute the company’s budget across different technological areas, as well as make projects comparable against each other (Cooper et al., 2001; Levine, 2005). Furthermore, it sends a clear message to the employees as bigger budgets suggests that certain technological areas are more important for the company’s success. However, the bucket structure is not coherent. As some buckets contain single projects, while others contain end product characteristics or entire technologies, comparing buckets is analogous to comparing apples and oranges.

When a project is allocated to a specific bucket, it is prioritized according to different methods, depending on the bucket. This creates a flexibility as the bucket owners can utilize the methods they believe are best suited to reach the long-term objectives of the bucket itself. However, there is a lack of formalized prioritizations methods across different buckets which perhaps makes the portfolio even harder to coordinate and optimize. Presumably, the prioritization process could be paired with the stage-gate model which is used during the product development process. It would be a way to provide fixed intervals where a re-prioritization could take place and also provide an opportunity for a more adaptable portfolio (Levine, 2005). Furthermore, projects are not continuously being prioritized after the initial prioritization. The tools used are heavily relying on financial metrics and several interviewees mentioned that instead of relying too much on financial metrics, it would be better to continuously review customer’s need and create products that serve them. Because prioritizations are often made in the beginning of a project and not afterwards, the question that arises is whether the current prioritization process is serving the portfolio as a whole, as changes that accumulate as a result of the external environment are not considered.

Stettina and Hörz (2015) consider prioritization a key activity in APPM, and we judge it to be highly important. Nonetheless, the performance of the APPM prioritization process was deemed low. This is mainly due to the fact that initial prioritizations were kept stable over time, meaning that projects were seldom terminated or put on hold. Agility requires processes to enable frequent alteration of business prioritizations, continuously revising the set of active projects to meet market needs. Effectively, prior investments are to be viewed as sunk costs and the projects with the current highest expected long-term value are to be prioritized. If this was the case, it would be wise to also discriminate between active projects with high prioritization and active projects with low prioritization. This means using the prioritization as a measure of importance and investing in top priority projects more than other active projects. If re-prioritizations occur and projects need to be killed or paused, it is likely to not be the top prioritized projects. This means the discrimination minimizes the sunk costs, facilitating the decision which in turn can increase agility.
Using dominant manual inputs to project scores can also have negative effect on the APPM if the user is not updated on prevailing market conditions. The process then becomes very dependent on the user’s assessment of contextual factors, and if those factors change often, the assessment will regularly be outdated. Furthermore, top-level prioritization should be implicit, empowering the teams (bucket work groups) closest to the prioritization. This is especially true if an incoherent bucket structure is employed, since it is difficult to accurately compare between projects in different buckets. Comparing an end product feature in one bucket with a technology in another bucket can lead to strategic misalignments and poor resource allocation. This can also create problems even with an implicit top-level prioritization, since an implicit prioritization is still a prioritization. Maintaining comparable buckets is thus beneficial to the prioritization process in APPM.

5.1.6 Communication & Decision-making
Communication and decision-making in terms of legacy PPM was evaluated as being performed moderately well. The company exhibits a structured meeting culture conducted on all different levels of the portfolio, involving all affected parties. Therefore, information is successfully transferred from top management, down to the project teams and then back up again. This meeting culture contributes to a shared reporting approach where information flows from projects to the portfolio level (Müller et al., 2008).

Even though information travels well between different levels of the portfolio, the case company struggles with handling information flows to and from individual projects. The reason for this is unclear reporting duties which consequently leads to an ineffectice project portfolio (Kendall & Rollins, 2003). Furthermore, if the duties in the bucket are unclear, it becomes difficult to provide high quality information and build a successful portfolio (Jonas et al., 2013) which will have a significant impact on the project level (Martinsuo & Lehtonen, 2007). To avoid this, project managers should not only report on the outcome after a project is finished, but continuously report on performance metrics concerning the project (Cable et al., 2004).

If performance metrics and cost developments are not reported to the resource capability system, it becomes difficult to plan the remaining resources. Therefore, there needs to be a clear connection between project planning and available resources. Furthermore, a portfolio view needs to be present to assure that certain performance and time requirements are being dealt with (Cable et al., 2004), as there currently is no control function providing this feedback.

The communication and decision-making theme was of both moderate importance and performance in the APPM. Just like formalization and cultural alignment above, its transformation is only done during the implementations of APPM and then kept stable. However, the communication then conducted through the subsequent APPM processes is highly important. The agile way of working is built on collaboration and interaction (Laanti, 2014; Stettina & Hörz, 2015), activities in which communication is central. It is not necessarily more important in APPM than in legacy PPM, but it needs to be applied to a wider set of processes and work groups.

The performance of the communication and decision-making at the case company varies. They have stage gate model with several decision point meetings and a meeting pulse delivering information between different levels in the hierarchy. In other words, the vertical communication and decision-making is working well. This means decisions can be made based on more information that otherwise would have been exclusive to one level in the organization. For example, strategic decisions made by top management can take development issues in certain buckets into consideration. However, the
horizontal communication is not performing as well. There is an unclear reporting hierarchy between project managers, bucket owners and the line organization and we have observed several instances of information not being communicated between these actors. To achieve agility, the collaboration between these PPM actors needs to be improved.

5.1.7 Number of Projects

The case company was performing moderately in the number of projects legacy PPM function. One important reason behind this ranking is the significant unwillingness to terminate projects after they have been launched. If a project is never terminated, it will not seize to take up a part of the budget until it finished. Therefore, it becomes difficult to regulate the number of projects in the portfolio. This will according to Cooper et al. (1999, 2001) lead to subpar project delivery and prolonged cycle times. According to multiple interviewees, this is true for the case company as well. The interviewees argue that many times the cycle times are too long and a big focus still lies on developing old technology.

There are too many projects that populate the portfolio according to the interviewees. It was mentioned that the case company needs to focus on properly communicating their strategy throughout the different levels in the organization. This is essential when trying to create reliable conditions when selecting the number of projects to be included within the portfolio. According to several interviewees, this would be a favorable approach as it would perhaps increase the probability of eliminating projects that are not aligned with the organization’s long-term objectives. This would also create prerequisites for the organization to handle complex and rapid changes in the external environment (Elonen & Artto, 2003).

Furthermore, it is of interest to discuss the case company’s individual ranking of number of projects function. When Cooper et al. (1998) performed their study based on 205 companies and measured different performance metrics of their current PPM structures, number of projects received the lowest scores both from best practice and poor performing forms. The survey results from the case company seem to follow the same pattern. Number of projects was ranked as the function which the company performed the worst, with a score of 4 out of 10. However, the importance of number of projects was only ranked as 5,5 out of 10. Clearly, the case company has failed to recognize number of projects as being important in their PPM process and it could be possible that problems for example within resource allocation, could be solved simply by being more attentive with the number of projects within the portfolio. Furthermore, a portfolio with the appropriate number of projects is key to the success of a company’s PPM (Cooper et al., 1999).

When considering the performance of APPM at the case company, it was assessed as being moderate. Too many projects were active simultaneously and the number of projects was decided only once a year, along with the distribution of the yearly budget. This induces problems for the case company when external changes occur or when actual spending does not follow the prognosis. The literature does not foretell much about agility in managing the right number of projects. Businesses need to be able to focus their efforts and avoid diluting the portfolio with unimportant projects that steals resources. In terms of agility, this means a willingness to kill projects just as much as starting them. Businesses should reconsider no-kill policies, since although they provide stability, they also inhibit agility. Decisions should be made based on maximizing benefits from projects and the long-term value of the portfolio, without including sunk costs.

There is an unanimity in the literature that frequent reconsiderations in the form of reviews are central to agility on the portfolio level (for example Stettina & Hörz, 2015) and continuous tracking of how many projects that are active is a part of this. As mentioned, the case company has initiated a change
toward this type of continuous tracking, to be able to evaluate how many projects that can be afforded anywhere during the budget cycle. Although not implemented yet, we believe this is the right way to go, as this would place the case company at the frontier in terms of agile management of the number of projects in the portfolio.

5.1.8 Balance

The balance function in the company’s legacy PPM was considered to be low performing. The main reason for this ranking is the absence of a formalized decision structure enabling the company to successfully identify and select projects that display different characteristics and therefore contribute to a well-balanced portfolio.

Judging from the survey, balance is not an important function in the PPM process but the case company still consider themselves as high performing within this function. The reason for the high individual ranking may be that the strategic buckets provide a sense of balance. As different technology projects in different phases are allocated to different buckets, a project mix with varying innovation level, risk and time perspective is created. However, factors such as risk are only considered on the project level and not the portfolio level, which according to Teller and Kock (2013) is what usually signifies unsuccessful PPM. Furthermore, it might be difficult for the case company to reach the objectives of their roadmaps that are used frequently in the strategic buckets. The reason for this is that if only individual project risks are considered, it might be tempting to disregard the accumulated risk occurring on the portfolio level. Furthermore, significant focus lies on the project’s profitability which adds to the portfolio dislocation and makes it difficult to properly assess projects as all new projects are compared according to their financial characteristics. It is therefore difficult to achieve a proper balance, as projects are never ranked across the portfolio, between buckets.

Many times, incremental innovation projects are favored over more radical projects. This suggests that the company is part of the “success trap” (Killen and Hunt, 2013) which ultimately will lead to an unfavorable mix of projects. As a way of introducing different performance characteristics, the bucket could perhaps be divided into two parts, where one part of the bucket is focused on handling projects that have divergent project characteristics (Killen & Hunt, 2013). This could be a way to align oneself with present and future demands (Staber & Sydow, 2002). Furthermore, the decision points in the stage-gate model could be utilized to continuously balance the portfolio (Cooper et al., 2000). An aid for this process could be found in the bubble diagram tool, in order to display current projects within the portfolio and therefore provide a decision basis for the company (Cooper et al., 1999). This would be beneficial as the case company has mentioned that there is an absence of portfolio tools which enable visualization of current projects.

According to Stettina and Hörz (2015), portfolio balance is highly important when it comes to APPM. However, the case company was low performing within this function. Although the case company exhibits some implicit balancing mechanisms (mainly through the strategic bucket system), it is not a process or activity that is actively conducted by anyone. To contribute to agility in the portfolio, balancing needs to be done actively and frequently to ensure that the portfolio at all times has the right levels of risk, innovation radicality and time frame ratios. As such, balancing is an operationalization of high level business priorities. The first step toward this is relative project characteristic assessments, where projects are evaluated against other projects and not just on their absolute ROI.

Some balancing occurs on portfolio level, but it needs to be considered inside the buckets as well. If a strategic bucket is supposed to represent an aspect of the business strategy, it has to fully cover that
aspect for the business strategy to be realized in total. The probably most important factor here is risk. The bucket’s work group should distribute risk and not pin bucket success on individual projects, especially if the risk is high.

5.1.9 Cultural Alignment

By having strategic buckets, the case company is able to enhance their current engineering culture where incremental improvements are key for the company’s success. Therefore, the case company was assessed as being moderately performing within the cultural alignment function of legacy PPM.

Given the company’s own low ranking of cultural alignment importance, one could say that culture is perceived as being sufficiently aligned. However, it is possible that the company is focusing too much on projects which emphasize their culture of incremental improvement. Projects should be consistent with culture (Levine, 2005), but changes in the external environment should be prioritized in a way that allows for the culture to adapt and become a source of sustained competitive advantage (Barney, 1991). This flexibility is difficult to achieve if projects are not terminated after a certain decision point. Furthermore, the focus on continuous improvements need to be adapted to the portfolio processes as well. This would enable the case company in the long term to learn about and improve their PPM processes.

Cultural alignment was deemed moderately important to APPM since there are several cultural aspects within the case company that affect the success of the APPM. One of those cultural aspects is organizational learning which exists to support agile behaviors and practices but does not exhibit agility by itself. Collaboration (Stettina & Hörz, 2015) and avoiding knowledge silos (Kalliney, 2009) were mentioned in the literature as important challenges in APPM and should therefore be considered and countered during an agile transformation. One way to tackle the knowledge silos is through formal knowledge sharing programs (ibid.).

The case company has a culture of implementing continuous improvements in project management and product development, but as far as we observed it did not extend to PPM. Some efforts were made to improve the PPM, but they did not bear any fruit. This is concerning, since the aggregation and distribution of knowledge is critical to APPM success. We also witnessed lacking communication between the work groups in the buckets, the project organization and the line organization, that is crucial in agile structures where responsibility is shared between the teams, the line representatives and the product owners (Stettina & Hörz, 2015).

5.2 Becoming Agile

As outlined above, the performance of the APPM practices are quite low at the case company. All analytical themes, except strategic alignment and communication and decision-making, are judged to be of low performance. How severe that may sound, it is mainly due to lack of attention to APPM practices. This is something we saw a change in, as not only more attention was given to APPM at the case company (which this thesis is evidence of), but also some initiatives were already taken. As neither academia nor industry have come considerably far regarding APPM, finding an overall highly or even moderately performing APPM at the case company would have been surprising. This is especially true when factoring in the long history of industry stability and the just recent increase in external turbulence. The need for APPM has simply not existed for that long.
This thesis focuses on the process as the unit of analysis. There are more aspects of APPM, some of which we cover when they are closely related to the processes. However, aspects like values and technology are consciously left out, not because they are unimportant but because they are out of scope for this thesis. When implementing APPM a holistic approach should be taken and, even though it is a cliché by now, agile should be treated as a philosophy, not as a quick fix. The processes are not enough and APPM is not a panacea, it will not solve all problems.

Cross-thematical considerations in APPM
This thesis provides a mapping of current processes, along with a description of possible alterations to incrementally increase the agility of those processes. Although some alterations are specific to a process, there are those that permeate the entire portfolio, of which some are viewed as especially challenging to a traditional industrial company. As such companies usually are more hierarchical, transparency and empowerment can become problematic. It requires a change in mindset to give up information and formal decision-making authority when it is such things that constitutes being a manager. This calls for a reinvention of the role of managers, where they focus more on guidance and communication than on exerting control.

This relates to company structure and the use of teams. Since the resources are owned by the line organization, they have power over and say in project execution. Consequently, people are mixed for every new project and the stable teams warranted by the literature cannot be implemented. It calls for resources to a certain degree to be owned by the project organization, or at least have more power over them. It means more than a change in organizational structure, but also in the internal power dynamics that can become a great challenge. To achieve this and become agile, it is important to collectively rework roles, keep the benefits in mind and have top management support for the change.

Another challenge is the cadence of routines and reviews, affecting all themes marked as highly important. This point was made by the survey respondents as well, whom stated that the case company needed to become better in providing feedback. Not only does the feedback need to be frequent enough to allow the business to follow the market, it also has to be synchronized to allow for the information to align the whole organization. Feedback is one of the scaled agile principles (Laanti, 2014), relating to portfolio processes and not only product features. For example, resource allocations, prioritizations and strategy need to be synchronized to utilize the strengths of APPM. Furthermore, to achieve agility, responsiveness to external changes is needed. This means mechanisms to sense needs and changes in the external environment must be in place. Dynamic capabilities (Teece et al., 1999) has been used successfully to analyze flexibility in PPM, which includes sensing the market. This is not commonly included as a part of neither PPM nor APPM, but as a prerequisite it needs to be considered.

Being agile means sacrificing stability for maneuverability, which means being organized for change at all times. It also means being willing to give up ongoing ventures to pursue opportunities in changing conditions, treating investments made as sunk costs. This can be a difficult change of mindset for everyone in the organization and can be a source of uncertainty. However, agile is about embracing uncertainty. This does not mean ignoring sunk costs, it merely means it is a price to pay for agility. Sunk costs should still be minimized through complementary agile practices. For example, through incremental resource allocation and following up on initial project prognoses, commitment and expenditure can be restricted to individual project phases and investments in weak projects minimized. Another example is focusing on fewer, more important projects that have a higher likelihood of staying relevant throughout the project life cycle. As agile methodologies on team level also help decrease time to market and regularly includes feedback, these life cycles can be reduced and their relevance ensured.
Implementation of APPM

The current research does not provide absolute answers in how to implement APPM. It is on the other hand clear that APPM has to be adapted to the context, beginning with questioning the need for an agile transformation and preserving that need as potential challenges are addressed. It is however advisable to have some basic legacy PPM practices (such as the ones covered by the analytical themes) in place to build upon before going agile, especially when taking an incremental approach to APPM implementation. In reality, this means taking current practices and making them more agile by introducing concepts and methods covered in this thesis. One example of this is the PPMO formalization, which both can help standardize practices before the transformation and help guide it. A centralized and coordinated effort is key to a broad implementation of APPM. For example, the PPMO can make sure that there are standardized prioritization models that is fitted to bucket goals, facilitating comparison and collaboration between similar buckets. Another example is the introduction of tools to be applied throughout the portfolio, such as bubble diagrams to visualize relative project evaluation needed for subsequent proactive portfolio balancing. In the PPMO, the team aspect of agile can be implemented. Here, several people with different competencies can help reviewing portfolio balance, improve processes or negotiate power dynamics with the line organization. All in all, this gives someone responsibility over the portfolio and the management of it, which introduces accountability and improvement intents. Even when taking a radical implementation approach, some PPM practices are good to have in place, just to gain some experience in what it means to manage a project portfolio.

Challenges also relate to the direction of implementation, whether it is done bottom-up or top-down will affect the outcome. This issue is touched upon by the literature, but no conclusions can be drawn on what the best approach is. There are some things to consider. First, a bottom-up approach can lead to portfolio agility being sub-optimized due to the requirements of the team level agility. If agility on the portfolio level is prioritized over the team level, a top-down approach may be better since it is based on the portfolio. Second, not all businesses employ agile project management in all departments. This can be problematic when taking a bottom-up approach, since this means non-agile departments will be subject to an APPM based on agile team practices. When introducing APPM top-down, it can selectively be adapted to align with practices from every department. Third, bottom-up approaches focus on scaling processes and thus can neglect meta-structures that can help improve agility. As there are two main goals with the introduction of APPM, they need to be considered when choosing an implementation approach. If portfolio alignment with agile processes at the team level is more important than responsiveness to external changes, a bottom-up approach is likely to fit well. This focuses on the team level product development and simply uses the portfolio to accommodate for that. On the other hand, if responsiveness is important, a top-down approach should be considered. External changes can then be sensed centrally, strategies adjusted and communicated throughout the organization.

Adopting SAFe

SAFe is a bottom-up approach that has experienced some success lately and is likely to be a good start. However, there are some things to consider when adopting SAFe. Since it is a bottom-up approach, it needs to be evaluated as an option in light of the overall goal of the agile transformation, as explained above. Also, SAFe focuses on processes and to some extent roles in the organizational structure, but it has no emphasis on agile values or technologies. Therefore, one should be aware that there are more aspects to consider to achieve a successful agile implementation. Furthermore, in SAFe, agile is the point of departure and thus a prerequisite for PPM rather than the opposite. The difference may seem subtle, but one should be aware that it can affect compromises made when practices clash.
6 Conclusion

The final chapter concludes the report by clarifying the answers to the research questions as well as their implications to both academia and industry. Limitations and suggestions for future research is subsequently covered.

6.1 Answers to Research Questions

This thesis employed a single case study to understand what challenges a traditional company in the automotive industry face when trying to become more agile in their project portfolio management in order to align their organization around agile practices on team level and increase responsiveness to external changes. Adopting an abductive approach, empirical data was collected using interviews, observations, documents as well as a survey. The study was operationalized through a primary research question, along with a secondary research question designed to serve as a platform to answer the primary research question. The answers to these research questions will be presented hereunder.

The secondary research question reads:

rq: How does the case company perform in their PPM compared to research?

The PPM processes at the case company are described in detail in chapter 4 and a comprehensive review of the extant literature on PPM can be found in section 3.2. The PPM performance of the case company is then discussed in section 5.1 and is summarized for each analytical theme in Table 5, in the PPM performance column. The findings were mixed and we observed variation in attention to different themes. The case company was performing relatively poorly regarding Formalization, Number of Projects and Balance, whereas they are doing well regarding Strategic Alignment, Resource Allocation and Identification & Selection. They are performing moderately when it comes to Prioritization, Communication & Decision-making and Cultural Alignment.

The primary research question was formulated as follows:

RQ: What are the main challenges to becoming more agile in PPM in the automotive industry today?

The answer to the main research question departs from the empirical evidence presented in chapter 4 and sections 3.3 and 3.4 in the literature review. This is then discussed in section 5.2 as well as in 5.3. Section 5.2 discusses the analytical themes and is summarized in Table 5, in the APPM importance and APPM performance columns. Our findings show that all of the analytical themes are important to APPM but that six of them are highly important, mainly because these themes need to be considered continuously while the rest only during the agile transformation. The performance of the APPM at the case company was found to be low for all the analytical themes, except Strategic Alignment and Communication & Decision-making. This means that there is a long way to go before their PPM can be regarded as agile. The main challenges here are arguably the themes of high importance for APPM but low performance, namely Resource Allocation, Identification & Selection, Prioritization, Number of Projects and Balance.
Section 5.3 discusses cross-thematical performance challenges to APPM. These require a holistic perspective of the portfolio processes and will affect several aspects of the organization. The main cross-thematical challenges were found to be:

- facilitating empowerment through management support
- conducting frequent reviews
- giving up sunk costs.

Together, 5.2 and 5.3 present the main challenges for a traditional company in the automotive industry to become agile in their PPM.

6.2 Implications

In this section the industrial and the academic implications are detailed.

6.2.1 Industrial Implications

Based on the findings from this thesis, it is evident that certain functions of APPM are more important for portfolio success than others. This has been concluded by investigating current PPM functions and determining how these could be made more agile. This is relevant for the industry, as it shows that classic PPM functions prove to be of great importance when making a transition from PPM to APPM. However, APPM is not restricted to the functions of PPM by any means. Instead, practitioners should adopt a holistic approach to PPM and consider cross-thematical performance challenges, which will greatly affect the organization’s success in making their PPM more agile and ultimately the success of the portfolio.

6.2.2 Academic Implications

The findings from this thesis contribute to the existing body of literature concerning PPM and APPM. It does so by providing an extensive mapping of a large industrial company currently active in a dynamic environment where time to market is becoming increasingly important. We have successfully applied APPM theories and provided an extensive report on the challenges of making PPM more agile. Even though this study has been conducted within the automotive industry, there are characteristics of the changing external environment which would most likely apply to other businesses in other industries.

6.3 Limitations and Future Research

In this section, we have provided suggestions which ought to be considered in future research in the area of APPM.

- It would be favorable to investigate a radical approach to APPM. In this thesis, we have adopted an incremental approach where we have assumed that PPM could be made more agile by building on current portfolio functions and including aspects from current APPM literature. Instead, it would interesting to investigate how businesses should approach APPM when there are currently no portfolio structures in place.
- The incremental approach adopted has also led to an analytical framework which consists of classic PPM functions. These functions have then been analyzed from the perspective of APPM literature. Instead, future researchers might consider synthesizing analytical themes from APPM literature and discussing these from the perspective of businesses within the industry.
• Furthermore, this thesis has focused on the processes of APPM. Alternatively, future research might consider focusing more on aspects such as structure, culture and values, in other words, the softer aspects of APPM.

• This case has been based on a single-case study. Even though there are interesting characteristics which most likely will be relevant for other businesses as well, collecting empirical data from one case study is not sufficient to make arguments about the industry as a whole. Therefore, multiple case studies are needed.

• Since challenges appear during transformations, it would likely be fruitful to conduct a longitudinal study of an agile transformations. By studying an organization before, under and after a transformation the main challenges during that period could be made apparent.

• Lastly, conducting a quantitative study would be of interest when going forward in this field of research. It would provide more statistically sound data and it would also facilitate the inclusion of a more widespread empiricism. This is especially important as portfolio management concerns multiple levels within an organization and it might be difficult to apprehend an exhaustive depiction without relying on a quantitative approach.
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Appendices

A Search words

The table below displays the search words used for the literature study.

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<thead>
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B Interview Guide Phase One

1. Could you introduce yourself, what is your work title and to what department do you belong?
2. What is PPM to you?
3. How do you affect the PPM at [case company] and how does it affect you?
4. Tell us about how you work with PPM.
5. What do you think are the main improvement areas?
6. Do you think increased flexibility in PPM is needed? Could it help with your suggested improvement areas?
7. Who is the owner of/responsible for the project portfolio?
8. Where do new project ideas come from?
C Interview Guide Phase Two

1. Resource allocation
   a. How are budgets allocated to different projects?
   b. How are the budgets redirected in case of needed change?
   c. How is the workforce allocated across projects?
   d. How is the workforce redirected in case of needed change?

2. Selection
   a. What criteria are used for project selection?
   b. What are the selection criteria at the different decision points?
   c. Is balance between different project characteristics (risk, short and long term, radical and incremental innovation) considered when selecting projects?

3. Prioritization
   a. What dimensions are used to prioritize between projects? Why?
   b. Are these dimensions consistent across the strategic buckets?
   c. Is balance between different project characteristics (risk, short and long term, radical and incremental innovation) considered when prioritizing projects?
   d. Do re-prioritizations occur? When, why and how?

4. Strategic alignment
   a. How is strategic alignment ensured?
   b. Does the overall strategic direction of [case company] ever occur? How does it affect the project portfolio?

5. Number of projects
   a. Is there a limit to how many projects you run at any given time? Is it regularly evaluated?
   b. What happens if it were to change?
   c. What tools are used to visualize portfolio content?
   d. Are capacity analyses performed? Is it known how much resources that are available?

6. Identification
   a. Where do new project candidates/ideas come from?

7. Cultural alignment
   a. Is cultural alignment considered in the PPM? How?

8. Reporting and communication
   a. How is portfolio reporting done?
   b. What channels are used for communicating PPM information?

9. Organizational learning
   a. Are there any initiatives in place to improve the PPM?

10. Formalization
    a. Is formalization something that is considered in the PPM?
    b. Does [case company] have a PPMO (Project Portfolio Management Office)? Is there a need for one?

11. Is there a need to be more agile in the PPM? Why?
12. What are the main obstacles in the PPM to respond to changes in the environment?
D Survey Questions

1. How satisfied are you with the current PPM at [case company]? (The respondent answered on a scale from “0 Very Dissatisfied” to “5 Very Satisfied”).
2. Please provide a short explanation to your answer to question 1.
3. How much impact has the PPM on the product development success of [case company]? (The respondent answered on a scale from “0 No Impact” to “5 Substantial Impact”).

A description of the analytical themes was provided at this point.

4. Please rank the themes according to importance for the PPM at [case company].
5. Please rank the themes according to performance for the PPM at [case company].
6. What is the main challenge for [case company] to improve the competitive position on the market?
7. How suited is [case company] to respond to changes in the external environment (for example new technologies or new competitors)?