MULTI-PROJECT MANAGEMENT IN AN INTERNAL DEVELOPMENT CONTEXT

A case study focused on identifying challenges in project portfolio management at ABB Components.

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**Cynosure** [noun]

Something that strongly attracts attention by its brilliance, interest, etc.

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ABSTRACT

The purpose of this thesis was to explore what challenges are identified in project portfolio management (PPM) in an internal multi-project environment. The aim of this study was to find the underlying reason for the occurrence of challenges in terms of how these challenges occur, and why do they occur. To realize the purpose and the aim of the study, the research was conducted at ABB Components, a business unit of ABB Group. Further, based on identified challenges provide a set of guidelines and recommendations for managing and countering the challenges.

To understand the research problem a literature review was employed and a case study was conducted at ABB Components. The purpose of the literature review was to gain a theoretical background related to the research topic, identify challenges or problems, and potential solutions, with the purpose of establishing a connection to the challenges identified in the case study. The empirical work consisted of the case study conducted at ABB Components and was constituted by interviews person. The analysis of the results was validated with a workshop held with interviewees, with discussions regarding the findings. Guidelines and recommendations for managing challenges related to project portfolio management were designed from the results of empirical and theoretical work.

The 11 main challenges related to project portfolio management were identified throughout three defined project phases, initiation of a project, execution of a project and project closure, and was appearing either in one phase or across phases. The challenges in this research were correlated to four main causes; limited resources (budget & time), limited resources (personnel), vague directives, and project maturity. The identified challenges can be encountered and managed by utilizing existing models for project management, improved information handling, expanding the notion of criteria for project success, performing a resource capacity analysis, and planning for the project closure.

The theoretical and practical work have contributed to a collective analysis of what types of challenges are evident in phases throughout a single project, and what outcomes these challenges can have on a project portfolio in an internal multi-project environment and. It has to some extent indicated differences among challenges and causes evident in multi-project
settings, for projects that are classified as internal development or product development, implicating differences throughout the project phase. Furthermore the challenges have pivoted around the three main themes centered indicating that there are challenges related to each phase of the project life, as well as challenges which are apparent across the project phases.

**Keywords:** Project Portfolio Management, Project Management, Internal projects, Challenges in project portfolio management
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Chapter 1

Introduction

In this chapter the reader will be introduced to the theoretical background of this master thesis, as well as the organization were the case study will be performed. The purpose that this research is centered around is formed on the basis of previous studies and a project description created by ABB Components.

1.1 Thesis Background

The foundation of a project portfolio management was founded in the early 50’s when Harry Markowitz pioneered the subject with the article Portfolio Selection (Markowitz, 1952). His work mainly focused on mathematical optimizations of investment project portfolios and how this affects an investor’s future returns. Since Markowitz’s article, researchers have kept on studying the subject with focus on external projects. The focus upon external projects mainly continued because these projects are easily analyzable and still generates profits for companies.

Engwall & Jerbrant (2003) argues that the empirical substance of theories on project portfolio management in multi-project environments until the early 2000s have been inadequate. Most of the empirical work founded by specific research settings; one type of project, one type of organization or a specific industry. Since their study were published in 2003, research in the field of project portfolio management have been expanding. Several recent studies agrees with early findings regarding challenges in project portfolio management, but argues that the definition of project portfolio management has expanded. The initial concept was mainly a method which would optimize the total benefit of the project portfolio, but when the knowledge and experience expanded the concept followed the same path. It is today including the organizations ability to select projects which contributes to the strategy and structure of the organization (Kaiser, Arbi, & Ahlemann, 2015).

In a multi-project environment, an organization is managing several projects simultaneously and the setting is unstable and frequently changing (Payne, 1995). It is described as an environment with conflict concerned by an ongoing competition between project priorities,
resources, personnel, attention and managers (Engwall & Jerbrant, 2003), (Platje, Seidel, & Wadman, 1994). Projects in a multi-project setting are often characterized by a shorter duration, small-to-medium sized compared to contemporary projects, and are often assigned resources from a common resource pool (Payne, 1995). Consequently, projects with separate goals and issues are being integrated into a management control and reporting system of a shared resource pool owner (Payne, 1995), which leads to challenges related to distributing resources, ensuring suitable control and management systems.

The modern view of the theory about project portfolio management emphasizes function, importance and resource allocation in project management within a multi-project environment (Engwall & Jerbrant, 2003). Research by Blichfeldt & Eskerod (2008) implicate that it refers to activities e.g. risk management, controlling and reporting and includes several factors. Müller (2009) is employing a broader explanation and mean that project portfolio management is about grouping specific projects to a specific skill and mean that individual projects are not required to be related to each other within the project portfolio. Müller (2009) suggest that actions in project portfolio management should be determining which projects should be included in the portfolio, prioritizing projects and allocating resources, and identifying measures for handling risks or challenges. LaBrosse (2010) argue specifically that project portfolio management is a method for organizations to manage and analyze current or planned projects in order to gain benefits which would otherwise not be achieved by projects on their own. The goal is strategically aligning resources between current and proposed projects and prioritizing sequencing between projects, in order to achieve strategic objectives for the organization. PPM is an ongoing process in which the portfolio is restructured and adapted to ensure that projects are beneficial to the organization and coordinated towards the organization’s goals (LaBrosse, 2010).

1.2 Company Background

During 1988 ASEA (Allmänna Svenska Elektriska Aktiebolaget) and BBC (Brown, Boveri & Cie) merged and founded what is today known as ABB. Since the incorporation, ABB has been a leader in power and automation technologies, operating in a global environment in approximately 100 countries with 145,000 employees. Today, ABB’s organization is organized into five global divisions; Power Products, Power Systems, Discrete Automation and Motion, Low Voltage Products, and Process Automation. Each division consists of business units, concentrating on specific industries and product groups. (ABB Inc., 2015)
ABB Components in Ludvika, Sweden, is a business unit under the Power Products division with 400 employees. It is responsible for the development and distribution of transformer components. Their organization consists of two subunits, process manufacturing of bushings and assembly of tap changers, both of which operate in the same highly competitive industrial production context. Their business is positioned in a market that is characterized by its advanced, developing and innovative products. In order to remain in and develop with the market, projects are an important and constantly recurring part of everyday work. Projects at ABB Components are of varying types, ranging from small internal projects to massive sales projects. However, all projects are performed with the interest of maintaining a leading position in power and automation, but with different approaches.

### 1.3 Problem Statement

Organizations have for decades been using project portfolio management in various iterations, but the understanding of how to manage the portfolio in an efficient way and occurring challenges is still limited (Patanakul, 2015). This is a phenomenon that is well-known, and hard to cope with even though researchers have identified several recurring challenges, were the most common challenges are related to; projects not being completed in time or within budget (Blichfeldt & Eskerod, 2008), resource allocation (Yaghoobkar & Gil, 2012), and knowledge transfer (Todorovic et al., 2015).

In accordance with previous studies, ABB Components is witnessing challenges related to management of their project portfolio. In attempt to overcome faced challenges ABB Components have implemented a project portfolio management model, in order to establish a common working procedure throughout the organization. The reasoning behind the implementation is that ABB Components wants to effectively, successfully and simultaneously manage internal projects and at the same time enable cooperation and inspection. A mutual plan for project management is important, but then again previous studies have shown that especially companies in a multi-project environment often are confronted by problems concerning project portfolio management (Patanakul, 2015).
1.4  Purpose

The purpose of this thesis is to explore what type of challenges ABB Components encounter in project portfolio management, with the aim of identifying how they occur, and why they occur. This research context will be based on understanding the occurrence of these challenges in an internal multi-project environment, set in the power distribution industry. The practical contributions of this thesis are aimed at providing a set of guidelines and recommendations for project owners, steering committees and project managers regarding the identified challenges.

1.5  Research Question

With regards to the purpose and problem statement of this thesis, the following research question have been designed:

*What type of challenges are ABB Components facing in their project portfolio management and how should ABB Components cope and its challenges?*

In order to facilitate a realization of the purpose and to concretize the problem, the authors formed the subsequent research questions (RQ):

1. What are the main challenges that ABB Components personnel have faced with project portfolio management and why these challenges affecting project portfolio management?
2. What challenges and solutions have been previously identified in studies regarding PPM and the environment that ABB Components currently operates in?

In pursuance of answering these questions and fulfilling the purpose, the authors are applying the following research methods:

- **Qualitative strategy:** A qualitative strategy is appropriate for this research, mainly because it allows the authors to strive after a narrative understanding and explanatory view of how the phenomenon affects ABB Components. The data collection in a qualitative strategy is based on questions of a ‘why’ and ‘how’ type, which matches the author’s objective to answer the research questions and with a describing and explaining result appraise a framework usable in multi-project setting.
  - **Inductive approach:** The research will be performed using an inductive approach, this means that concluding theories and result will be formed from observations and findings that the authors discover at ABB Components during their research.
• **Case study design:** Since this research will examine how ABB Components are affected by their project portfolio management, a single case-study design with a mix of a representative and a revelatory features will allow the authors to conduct the research with a suiting method. Interviews and a workshop will be used to gather data in this research.
  
  o **Interview:** Using interviews as the main tool for data collection will ensure that the authors gathers the interviewees' personal thoughts about the phenomenon. A semi-structured style will further secure that the narrative and explanatory answer are correlated and applicable to the purpose and research question.
  
  o **Workshop:** The idea behind a workshop is to let the interviewees’ get access to early results and findings, this will act as a validating phase at the same time as allowing the authors to collect further data.

• **Literature review:** A literature review will identify what previous studies have found on the subject, emphasizing occurring problems in project portfolio management and why they appear. Connections to problems identified in the case study will also be examined in order to find and suggest solutions to solve them.
Chapter 2

Research Methodology

In this section, the primary methods used in this master thesis will be described and explained. Firstly, the authors will define the continued disposition of this research. Secondly, a clarification for the chosen approach, research strategy and case study design will be presented. A description of how empirical data will be collected and analyzed will be included, as well as, the methods that will be used during the process.

In pursuance of achieving the purpose of this study, the further disposition of this master thesis will follow a pattern that allows for a clear and accurate presentation of methods, theoretical insights, empirical data, analysis, discussions and a final presentation of this thesis conclusions.

Chapter 3 Literature Review is in detail presenting information regarding the internal multi-project context that this thesis is performed in as well as a summary of the main challenges that have been identified in previous studies. This whole chapter is a part of the literature review, related to RQ 2, that were conducted with the purpose of identifying challenges and issues in previous research The remainder of the literature review is presented simultaneously with empirical data collected from interviews and analysis in Chapter 4 Case Study in order to answer RQ 1. The reasoning behind structure is that it will limit repetition of theoretical information at the same time as important aspects will be presented in one place, which will facilitate the readability and comprehensibility of this thesis. Subsequently, Chapter 5 Discussion presents perceptions and understandings on the findings of the literature review and case study, which also works a way to present direct answers and discussion related to the research questions. Chapter 6 Guidelines and Recommendations and Chapter 7 Conclusions, are both sections were conclusions are presented but with different primary audience. Chapter 6 is mainly directed towards ABB Components or industries in a similar situation and context. While, chapter 7 is concentrated at presenting the general and theoretical conclusions of this thesis.

2.1 Research Strategy

The authors have by the nature of the case-study, decided to perform this thesis with a qualitative research strategy, with data collection provided by interviewing ABB employees.
The central research question in this thesis and its subsequent research questions are characterized by the question type ‘Why?’ The authors seek to answer these questions and are concerned with describing and explaining the phenomena, and intent to appraise a framework usable in multi-project setting.

In this study, the case itself is employed in a social setting within a multi-project context, with several individuals interacting in a changing environment. For this research, providing a clear and detailed explanation of the phenomena and its underlying mechanisms is significant. With a setting subjected to change, founded on the relations of individuals, there is room for extensive reporting of details that could likely have an impact on the phenomena. Bryman & Bell (2011) states that using an approach that is detailed and providing information, some details may at first seem irrelevant, and that there is a risk of being entangled in details. However, one of the main reasons for emphasizing descriptive detail is the contextual understanding of social behavior (Bryman & Bell, 2011). This implies that the description and understanding are applied to the environment in which the individuals operate (Bryman & Bell, 2011). For this study, this means the behavior and values are accounted for in a multi-project context at ABB Component. It is the authors’ intention to understand the employees and to take into account their perspectives and descriptions of project portfolio management, which is of great value for understanding the phenomena. It is the authors’ notion that achieving this is not obtainable through measures of quantitative research. The research and the case study is founded by the employees, and the setting in which they act. Therefore, qualitative methods and its tools are preferable. The authors’ mean that the phenomena of project portfolio management in a multi-project context is better provided through qualitative descriptive approach. Since the authors strive for understanding the construction of the phenomena and its underlying mechanisms that constitutes this research a qualitative method is preferred. Secondly, the study aims to provide a practical framework that can be operated in an everyday setting. Thereby, the authors suggest that this can be facilitated by interaction with employees in their natural setting.

2.1.1 Inductive approach

The approach used in this research is inductive, meaning that theories and result are generated from findings. However, even though the fundamental approach is inductive it entailed some elements of deduction. Bryman & Bell (2011) mention that research very rarely is entirely deductive or inductive, some essential parts of the research are performed with the contradictory approach. Therefore the research approach often could be defined as a rather iterative theory.
The initial phase of this research began after the authors met ABB Components and got introduced to the case were one of the deductive element of the study. The phenomenon had been announced which were followed by a pre-study. A process of reviewing and reading literature and existing theories, then facilitated development of research questions, interview material, etc. Following the deductive feasibility study, the authors conducted their empirical data collection, interviews at ABB Components. The data gathered by the authors during interviews directed the upcoming research. Based on the objective to fulfil the purpose of this research, which is to identify what, how, and why problems occur in project portfolio management, the most commonly identified problems during interviews were subject to an extended review of previous studies. The second and more comprehensive literature review are one of the parts of an inductive research approach, the objective is to discover valid connections between research and this particular case.

2.1.2 Qualitative research model

Bryman & Bell (2011) explains that qualitative research can be visualized as a model consisting of six steps. Their model has been used as a foundation for our own version of a qualitative research model, which is presented in Figure 1.

*Step 1. General research questions* can be specified differently and stated with varying explicitness. Sometimes, research questions can be formulated in a general statement of an article while others choose a more explicit way. However, research focus and design of research questions should not exclude alternative inquiries which may come up during the data collection. In this study, the general research question have been formed with regards to the case provided by ABB, on the subject of management of internal development projects. In addition, the general question is designed with regards to research on project portfolio management and more specifically management of internal development projects. Furthermore, the question is not too explicitly designed, meaning that subsequent questions have been formed for the general research question.
Step 2. Selecting relevant site(s) and subjects. Selection criteria should be based on relevant events or areas of research which provide a scope suitable for the intended research. The organization in the study have reported challenges related to managing internal development projects in their project portfolio. Additionally the organization attempts to find solutions to identified challenges, in order to form a set of recommendations and guidelines used for internal projects. The author seek to study challenges related to internal project portfolio management, therefore, the case, and its background fulfills the criteria of being.

Step 3. Collection of relevant data. Can be done by using different methods, such as observations within the workplace during sessions, or several in-depth interviews with employees of different position. Selecting relevant data is valuable in order to capture insight of the social phenomena studied. The study in this research has been conducted over a five month period, in which ABB Components and its employees, have been working with internal development projects and coping with the challenges related to project portfolio management. In order to capture the phenomena, empirical data, as described in Chapter 2.3 Data Collection, has been gathered through semi-structured interviews. With regards to whether the
individual is in a leading position or a member of a project team, participants have been selected to provide diverse answers.

**Step 4. Interpretation of data.** In this research, the authors have used guidelines, see Chapter 2.4 *Data Analysis*, provided by Bryman & Bell (2011), which provides a coding framework of data from qualitative research and interviews.

**Step 5. Conceptual and theoretical work.** Theoretical work or concept can be extensive, but the outline is at times narrowed and studied throughout the stages of data collection. Concept or theory which is related to the study and interpretation of data can be re-evaluated as time progresses. Based on findings from interpretation of data, concepts and theories used have been developed or modified. The authors in this research seek to suggest a greater generalizability regarding internal development projects and challenges related to the management of these.

**Step 5a. Tighter specification of the research questions** and **Step 5b. Collection of further data.** During the data collection process, it can be useful to proceed by refining research questions, collecting further data and then reconnecting with interpretation of data. Data collected from interviews has been used for reshaping and refining the research questions used. Findings and conclusions during a workshop with interviewees has provided additional insight linked to initial data gathered from interviews.

**Step 6. Writing up findings/conclusions.** Presenting conclusions and findings is in qualitative research as significant as in quantitative research. Conclusion or findings are a result of the researcher’s work on interpretation of empirical work related to theory and concepts. In order for it to be convincing and credible to a reader, it has to be more than just a conduit of what the researchers have observed. For this study, the researchers aim to provide findings and conclusion and offer the reader a clear view of the relevance and use of concepts and theories developed. The conclusions are based on the results from empirical data and the authors’ interpretation of data, related to both concept and theories.

### 2.2 Case Study Design

Since the authors of this research received an almost completed project description the possibilities to choose a case study design were limited. As defined in *Chapter 1.4 Purpose* the objective of this study is to identify and determine why problems occur in project portfolio management in ABB Components and ultimately suggest improvements. Out of the two
subsequent research question presented earlier, there are one that will be responded to via case study analysis and findings.

RQ1. What are the main challenges that ABB Components personnel have faced with project portfolio management and why these challenges affecting project portfolio management?

In order to answer research question 1 and to satisfy the purpose, a thorough analysis of the organization and project activities is required. For that reason, the research will mainly focus on this single case and its underlying cause. The case study design used in this master thesis is therefore based on Bryman & Bell (2011) and Yin (2003) guidelines for a single case study.

Bryman & Bell (2011) argues on the basis of Yin (2003) that there are five main rationales for when a single-case design is applicable. These rationales are critical case, extreme or a unique case, representative or typical case, revelatory case and longitudinal case. The case examined in this master thesis are according to the authors, a combination of a representative and a revelatory case. A representative case is when the target with the research is based on a common phenomenon that is relevant to the average member of the sector. (Bryman & Bell, 2011) This line of reasoning is appropriate since previous studies on the subject have found that especially resources allocation is a major issue whenever project portfolio management is discussed. This statement satisfies RQ 1 and creates opportunities to relate this study to previous research, see Chapter 3 Literature Review. A revelatory case is a situation when the researchers observe and examine circumstances which previously either haven’t or have been subjecting for a limited investigation (Bryman & Bell, 2011). Previous studies in the area of project portfolio management have mainly focused on external projects or sales projects. Therefore this study will put emphasis on internal developing projects and the management of these.

2.3 Data Collection

Based on the case that this master thesis examines, and the data collection methods presented by Bryman & Bell (2011), the authors, decided to use a combination of three methods for their gathering of data. These methods are semi-structured interviews, focus groups (workshop), and analysis of documentation. The reasoning behind the selected data collection methods originates from the features of this particular case. Since this research examines a social phenomenon with focus on finding a describing and explanatory cause for the occurrence is it essential to cover a broad range of possible outcomes at an early stage. In order to enable an open and unbiased result, the authors did consider several empirical data collection methods,
which collected roughly the same sort of information but with different approaches. Since, the authors have selected multiple methods for empirical data collection a methodological triangulation will be utilized in this research.

### 2.3.1 Interviews and workshop

Interviews were performed with the main purpose to gather information regarding the past and present situation, emphasizing problems occurring in project portfolio management and their causes. Coherent with realization of the purpose of this research, a semi-structured interview approach was selected because of how the purpose and research questions were formulated. With the aim to answer the research questions the authors needed the interviewee’s response to be narrative and illustrative about their current situation. In order to acquire a solid base of empirical information from the interviews, an interview guide was created based on Bryman & Bell’s (2011) guidelines. This procedure is described in more detail in Chapter 2.3.1.2 Interview Guide. For full interview guide, see Appendix 1.

The nature of the interviews was shaped by the dialogue between its participants. Therefore, some measures were necessary in order to guarantee the respondent’s consent. Before an interview, all respondents were sent an invitation for an interview, with information regarding the purpose of the interview and research, and their role in this research. Bryman & Bell (2011) argue that during interview meetings, prior to start, each of the respondents should be reminded of the purpose of the interview in order to ensure congruency between the researcher and respondent. In addition, all respondents of this research have agreed on the use of recording devices during interviews. By recording the conversation, the researcher can be sure that the interviewee’s complete description is accounted for. At the same time, the researcher can maintain a natural conversation in which he or she can steer the conversation towards desired themes or topics (Corbetta, The Qualitative Interview, 2003). For the researchers this enabled a more objective interpretation of what the interviewee said, since a more thorough examination of collected data could be performed. In addition, it facilitated the data analysis process, since the authors could be sure that collected data was accounted for as the words of the interviewee and not an intuitive interpretation of what might have been said.

During processing of information, the names of participants in this research have been excluded, to maintain confidentiality, which was an agreement between the researchers and the participants. To ensure ABB Components and ABB’s confidentiality regarding company business secrets, the supervisor of this research have reviewed this thesis before publication.

As mentioned in Chapter 2.1 Research Strategy, this research has in addition to regular semi-structured interviews used focus groups as a method to gather supplementary data.
Furthermore, the focus groups, or workshops as the authors like to name them, has worked as a way to validate the researchers’ findings. Yin (2014) means that informants may have a different interpretation of interview results and, therefore, reach a conclusion in contrast to the researchers. It can be further argued that a follow-up workshop with reviews can add additional insight and evidence for the case study. This is because informants may come across new material, which in the previous phase may have been forgotten (Yin, 2014). Data collected from interviews was presented by letting the workshop attendees learn the early theories, results and conclusions formulated by the authors. This process compelled the workshop participants further to develop the group’s opinions in a way that evoked new and previously unmentioned information about the case. Besides a certain degree of validation, working with the workshop allowed the authors to generate valuable data about the second part of this research purpose, which involves creating material for a framework with guidelines of how to manage challenges.

The whole workshop was discoursed in a conference room at ABB Components, during a three hour session. The workshop was founded by four activities; presentation of findings from research data, rating of the relationship between problems and their causes, risk assessment of problems, and presentation of guidelines regarding how to handle the identified challenges. Following each activity a discussion was held, between the participants and researchers.

Presentation of findings from research was constituted by the empirical findings from interviews together with collected theoretical work regarding challenges and their features. Rating of the correlation between issues and their causes, was an activity where the participants of the workshop completed a form, rated from a scale of one-to-five, the relationship between the identified issue and the cause of occurrence. This activity was made use of for finding indifferences between the perceived value from research data and the participants view on the subject. Risk assessment was implemented to appraise the perceived risk of the identified challenges. During the risk assessment each workshop attendant was asked to fill in a form with identified challenges and evaluate the risk. This risk valuation was performed with the purpose of letting the participants evaluate how severe the challenges could be. The risk was defined as the product between the probability of occurrence and consequence, where each variable was rated from one-to-five, yielding results ranging from one to twenty-five. The risk assessment was, however, only evaluated by the participants since the occurrence for number of challenges was accounted for throughout the interviews.

The rating of the correlation between the challenges and their causes together with the risk assessment served as an appraisal of what challenges were perceived as important and their probable cause. Both the rating and the risk assessment is evaluated by numerical values,
However, they are established by the participants and their experience regarding the challenges faced. The reasoning for this is in line with developing a framework of guidelines for managing challenges, which are related to issues in project portfolio management and more specifically challenges related to the studied organization.

2.3.1.1 Sample

Ten interviews were conducted with personnel at ABB Components with various roles in order to gather the majority of this master thesis empirical data and allow for an elaborated analysis of interview information to be performed. Additionally, the research is set by a deadline, and the following analysis process is rather time-consuming. Therefore, the authors mean that ten interviews is justified as enough to gather a base of useful data. Kvale (2007), states that the correct quantity of interview subjects is highly dependent on the type of research that is performed. “Interview as many subjects as necessary to find out what you need to know.” Problems of different sorts can and probably will occur either if the number of interview subjects is too small or too large. Too small may lead to problems with generalization and testing hypotheses, at the same time, a too large sample tends to make the research time-consuming and difficult to draw conclusions (Kvale, 2007). Bryman & Bell (2011) states similarly to Kvale (2007), that a proper sample size for a qualitative research of this kind is 15±10 subjects (Bryman & Bell, 2011). The ten individuals that participated in this study were selected in a way that enabled a widespread of personal insight, experience, and project participation. The selected interview respondents currently have roles stretching from ABB Components senior management to newly employed project managers. The reasoning behind the selected sample of interviewees was to ensure that people with varying responsibilities, competence, and hierarchy level contribute to the research. With a diverse mix of participants the possibility to obtain a complete and comprehensive collection of data increases. During the workshop six out of the original ten interviewees attended, but the diverse role distribution were still intact.

2.3.1.2 Interview Guide

Bryman & Bell (2011) argues that the researcher should ask ‘what do I need to know in order to answer each of the research questions I am interested in?’ The research questions modelled in this thesis is about finding out why there are challenges in ABB components project portfolio management and their impact on current project portfolio performance. In similarity, the purpose stated aims to construct material for a guidelines and recommendations for managing and coping with challenges related to project portfolio management.
The authors argue that achieving this is easier by establishing a set of predetermined topics or themes employed in the interview. Therefore, the interview guide will facilitate the process. Bryman & Bell (2011) argue that the researcher should try to account for what seems to be important for the interviewees, in relation to the researched topic areas. Therefore, the interview will cover areas interesting for the researcher, but from a perspective of the interviewees (Bryman & Bell, 2011). This means that the interview guide will be used in order to ensure that crucial information from the interviews regarding impressions, experiences and opinions is captured.

Guidelines from Bryman & Bell (2011) are in combination with Kvale’s (1996) suggested questions used for the interview guide. Bryman & Bell (2011) mean that it is preferable to have some themes prepared with a structure, to facilitate a transition between questions and themes. The themes or topics should not be formed too precise but at the same time structured towards answering the research question. Further, leading questions should be avoided.

The interview guide used in this study is constituted by three themes covering the interview with the purpose of gathering information regarding the research questions. Further, the themes are formed to provide purpose and context for the interviewee regarding the particular question. With each theme, there is a set of prepared questions linked to the literature review.

*Introducing questions.* Are formed with the purpose of getting background information about the interviewee. This information is used to describe employees and their function within a team. This also provides an understanding of the continuing answer by the individual.

*Theme 1 – Project initiation.* These are questions formed with regards to the members of the organization. This theme explores the employees’ opinion on; initiation of a project, choosing or establishing a steering committee, utilizing project feedback & documentation, and opinions on efficiency & effectiveness. The main outline of this theme is; what are the methods used during this process, what are the challenges related to the methods used, and how could things be improved related to the method and subject. The purpose is to gain the participant’s insight of these subject and challenges.

*Theme 2 – Project execution.* This theme aims to understand what are the methods used for working with projects, to which degree these are utilized, and which challenges are related to the current methods. In addition, examines whether the methods need to be utilized more or if there are ways to improve the process. Furthermore, it explores how time is managed and planned in-between projects, how the steering committee is working towards project goals, and challenges related to the governing work. Lastly, the theme aims to find out whether or
not activities outside the project are affecting the project, what kinds of activities are prioritized, and how this can be avoided or improved.

Theme 3 – Project closure. The primary purpose of this theme is to gain the employees’ insight of how feedback is ensured between current and future projects. Secondly, it aims to discover what challenges arise during the closing and handover phase and what improvement could be made.

Concluding questions. The last theme is used to let the employee reflect on whether or not challenges that have arisen could have been avoided if was accounted for during the planning phase. The purpose is to find whether challenges are linked to the planning stage, and whether the employee would like to amplify answers or add additional information regarding covered topics.

2.3.2 Analyze of Documents

Documents that previously had been produced internally at ABB were used as a foundation of material about the historical aspect regarding the situation. Informational documents concerning projects and project management mainly constitute the documents used as empirical data in this master thesis.

2.4 Data Analysis

The data analysis is based on summarization and sorting of transcript data. Initially data from interview transcripts is summarized into shorter segments or sentences and sorted to each of the main themes covered in the interview guide; background, project initiation, project execution, and project closure. This method of handling data provides an overview of what kinds of topics emerged during the different stages throughout the project process.

Summary of data provides an extensive outline of what kinds of challenges and methods were identified during the interview process. However it does not provide a clear translation of what challenges are connected to each of the main themes. Therefore, sorting of data provides a detailed description of what kind of challenges are related to each of the main themes. Sorting gives a better structure of the emerging topics related to each theme, and it provides a greater overview of relations between topics for each main theme. The authors mean that this facilitates the process for finding topics related to literature, since it employs a framework of challenges related to different steps of project process. In addition it provides an easier overview for the reader, since challenges are related to the central themes covered within the
interview, and at the same time taking into consideration the research question(s). This gives the reader a general idea of what types of challenges are identified throughout the process and what these challenges entail. In addition it corresponds with the authors’ inductive approach of identifying challenges related to PPM in internal development projects, and finding theoretical work and concepts related to issues.

This strategy is similar to one of the key steps presented by Bryman and Bell (2011), which is concerned with coding in grounded theory. The process of coding is simply involved with using data and splitting it into different categories, which can be formed by single words or sentences, constructed by the researcher. This is something employed during either the data collection stage or from the transcribed data. (Bryman & Bell, 2011)

Transcribing interview material was done with the help of the computer software ATLAS.ti. In this software the recorded file can be attached to a document file, that enables the user to set anchor points (which works as dividing the interview into segments). While listening to the recorded interview and writing the transcription, these anchor points can be set and used as tracers of what has been said throughout the interview. By splitting the interview into pieces selected segments can be named by single words or described by sentences. These segments will then enable the user to freely go back and forth between segments which will facilitate the process of browsing chunks of data. Similarly like creating anchor points, the software enables the user to create codes during or after transcription. These codes can be either single-words or phrases, describing the segment of text. The authors chose to use ATLAS.ti as a tool for facilitating the process of handling interview data, rather than just transcribing interviews word-for-word.
Chapter 3

Literature Review

In this chapter the theoretical framework will be introduced for this study. The format of this study has resulted in a reduced literature chapter due to the integration of empirical, theoretical and analytical work in chapter 4. The chapter begins by a brief historical overview of projects and project portfolio management. Furthermore, topics and challenges associated with project portfolio management will be presented.

Historically, projects have had a significant influence on the development and the life of society. There are ancient records from 2570 BC that illustrates how projects and especially project managers, played an important role overseeing, planning, and executing the completion of the Great Pyramid of Giza. Other historical achievements, such as the construction of the Great Wall of China also utilized projects and managers in a successful way. (Haughey, 2014) Although, projects have been used for thousands of years it was not until the 1950’s that advanced studies on the topic were performed. Markowitz (1952) introduced the foundation to project portfolio management with his work on The Modern Portfolio Theory. His theories about project portfolio management focus on the financial part of projects, with emphasis on mathematical models based on economic theories. These would result in the optimal combination and quantity of projects which would generate maximum revenue.

During the upcoming decades after Markowitz’s work, several researchers developed the theories of project portfolio management. Chapman et al. (1985), among others, expanded on previous project portfolio management theories when they proposed that risks and uncertainty must be included in the project planning process. Roetheli & Pesenti (1986) continued the development of project portfolio management theories when their work got published in 1986. Their research follows the work that previously had been performed by Markowitz and other scientists. Roetheli & Pesenti state that a project portfolio should be a well-balanced group of projects that covers a range of risk, technical hazards, duration, completion date, and estimated turnover. Beyond these factors, they include an additional factor, long-term viability.

During the 90’s portfolio management studies shifted focus towards more detailed planning and the importance of resource allocation. Platej et al. (1994) states that a multi-project organization demands complex planning, and allocation of costs and resources between ongoing projects, often with conflicting interest. As a result of the shifted focus, they
introduced a new concept to project portfolio management that is based on communication and delegation requirements. Their concept could be seen as a model which is constructed in a way that requires that all responsibilities and decision-making are delegated at the lowest available organizational level. This results in an improved communication and participation throughout the entire organization, besides this it also entails mutual planning and a control unit for single projects and the whole project portfolio. (Platje, Seidel, & Wadman, 1994)

Some of the more recent research on the subject of project portfolio management, has instead of developing and finding new aspects to previous theories, focused on why problems occur in portfolio management and how they are solved. Blichfeldt & Eskerod (2007) are one of many researchers that tried to explain why businesses in a multi-project environment often are experiencing postponed projects, problems with resource allocation, stress, and insufficient project overview.

3.1 Internal projects

Elonen & Artto (2003) define internal projects as activities characterized by the aim of improving business performance. Moreover, Elonen & Artto (2003) state that typical projects may be business development projects, investments in equipment, improvement in internal information technology systems, and investments in other capital projects.

Authors Shenhar et al. (2002) meant that internal projects are operational or strategic and can be categorized into three types; utility, problem-solving, maintenance and research.

Problem-solving projects are often focused on specific areas with problem-solving in the short-term. These projects are usually considered when managing complex technical solutions, usually advocated in the manufacturing industry. Utility projects are often concerned with undertaking activities that assist the organization. Activities included in these projects could be, reorganization of software or implementation of technical software. Maintenance and research projects, are projects characterized by lower-priority, with the purpose of developing ideas and concepts, which are usually useful in the future. (Shenhar et al. 2002)

Blichfeldt & Eskerod’s (2008) mean that the internal projects part of a portfolio are usually larger development or renewal projects, e.g. developing the organization, or new IT solutions and strategic projects. Blichfeldt & Eskerod (2008) proceed by stating features suitable for projects within a portfolio, subject to PPM. The beginning of a project and its end results are not directly related to the market demand. Projects can be characterized by interconnection across units, departments or an entire company. The aim of the project is not exclusively to
gain value for the customer but to enhance internal activities in the organization. (Blichfeldt & Eskerod, 2008)

3.2 Multi-project Environment

The main problem with managing multi-projects is related to the resource pool, and the allocation of resources that it entails (Payne, 1995) (Platje, Seidel, & Wadman, 1994) (Engwall & Jerbrant, 2003) (Hendrik, Voeten, & Kroep, 1999). The interdependency between personnel in multiple projects enforces resource allocation and makes scheduling vital (Engwall & Jerbrant, 2003). Issues in one project can have a direct impact on another project (Payne, 1995), due to redistribution of personnel, or lack of technical solutions which were improperly scheduled or not available (Engwall & Jerbrant, 2003). The interdependency of resources is related to the competition caused by the common resource pool, resulting in an ongoing game of discussions regarding the right to employ resources, reposition individuals for a particular project, and utilize the right knowledge for a specific project (Engwall & Jerbrant, 2003).

Engwall & Jerbrant (2003) concluded that in most cases, where resources were reallocated, an adverse outcome was formed in unanticipated places in the project portfolio. Uncertainties in project priorities, in juxtaposition with indefinite effects from relationships between projects, and mutual interests between organizational units, can cause an overload of problems enforced by the portfolio management and implementation. Furthermore, Engwall & Jerbrant (2003) raise the issue with ad hoc short-term problem solving, which is a situation in which middle management or steering committees, are engaged in solving challenges related to project management. It had a direct impact on long-term knowledge and process development which have been beneficial for the portfolio, since it was prioritized down.

Platje, Seidel, & Wadman (1994) argues that projects that are dependent on the same resources, and, therefore, middle management and leaders should not focus all effort on their projects. There has to be a congruence between the individual’s effort of executing interdependent activities in a project and the teamwork required at a portfolio level. Payne (1995) indicated that commitment in individual projects and focus or providing resources is significant, but even more so, it is especially relevant in multi-project setting. A project's size is usually the determinant of how the project is perceived as important. Payne (1995) highlighted in his article that it is of significant value that projects of different size are provided with the proper resources. However, one must shift the focus away from the project size, and aim to the organizational outcome of the project.
Payne (1995), Engwall & Jerbrant (2003), and Spühler & Biagini (1990), noted that in most cases it is rare to reach a state in which there is a balance between resource available and the resources required. Therefore, is the issue of managing resources in multi-project environments which is related to an over commitment to projects, meaning that there are more projects initiated than resources available. Platje, Seidel, & Wadman (1994) also discourses this and argue that, with the initiation of more projects comes requirements and trade-offs between projects or units, necessary to maintain portfolio management. Engwall & Jerbrant (2003), conclude in their final statements that resource allocation syndrome in multi-project management is not an issue in itself. It is a congregation of other organizational problems in a multi-project situation.

### 3.3 Project Maturity

Thoughts about project maturity and how it affects organizations started to grow and develop during the mid-1990s based on the concept of process maturity which previously had been introduced as a part of the Total Quality Management movement. Project management and especially maturity have two dimensions, which both needs to be managed; Technical dimension and human dimension. (Cooke-Davies & Arzymanow, 2003)

Andersen & Jessen (2002) presents three organizational and individual components that have a high impact on an organizations project maturity; **Attitude**, the mental position of individuals or the project team; **Knowledge**, understanding about each of included elements in the production as well as comprehension about the strategy and targets for the organization; **Action**, how and when organizations makes decisions about projects. Furthermore, these three components are divided into 4 subcategories:

- Attitudes towards risk and insecurity
- Attitudes towards power and responsibility sharing
- Attitudes towards hard and soft values
- Attitudes towards co-operation
- Knowledge about supposition
- Knowledge about ways of working
- Knowledge about desirable results
- Knowledge about totality
- Action taken at strategic level
- Action taken at tactical level
- Action taken at administrative level
Cooke-Davies & Arzymanow (2003) states that it seems logical to assume that an organization improves its project maturity when they are subject to commercial pressured for a long period of time. This may be related to the fact that repeated contact with the 12 subcategories declared by Andersen & Jessen (2002) will force an organization to gain experience and make further work more efficient. There is also a significant difference between different sectors, engineering-based industries have more frequently adopted a project management which could be argued to be mature. Nevertheless, Andersen & Jessen (2002) does conclude a set of guidelines for achieving a more project mature organization that all organizations should have in mind. Firstly, these guidelines state that projects must be more focused on simultaneous thinking and prioritizing. Secondly, the organization need to increase their knowledge and understanding about how projects are initiated. Finally, project managers and teams must focus on the operational level of projects. Furthermore, Cooke-Davies & Arzymanow (2003) state that organizations which indicates that they have a significant level of project maturity, often still have room for improvements regarding their multi-project management. This is particularly true when it comes to adjusting resources between projects.

3.4 Summary of Challenges Identified in Previous Studies

This segment contains a brief summary of the challenges identified in project portfolio management in multi-project environments.

Over commitment

Previously identified cases argues that the launch of too many projects is an issue related to a lack of resources (Engwall & Jerbrant, 2003). This issue is further addressed by Spühler & Biagini (1990), who states that there is almost not a single company that does not initiate more projects than it can manage with the resources available (Payne, 1995).

Common resources

In a multi-project environment numerous projects are run simultaneously, which forces sharing of common resources and to some extent causes concerns with prioritizing projects, since there needs to be a smooth distribution of personnel across projects (Engwall & Jerbrant, 2003). Payne (1995) argues that the balance between required resources is rarely achieved, since most of the personnel is involved in multiple projects.
**Project interdependencies**

The dependency on personnel for multiple projects enforces resource allocation and makes scheduling vital. Issues in one project can have a direct impact on other projects, due to the redistribution of personnel, or the lack of technical solutions which were improperly scheduled (Engwall & Jerbrant, 2003).

**Competition between projects**

With the project interdependence and resource sharing, discussions arise regarding permission to resource and reallocation regarding certain individuals to specific projects (Engwall & Jerbrant, 2003).

**Schedule pressure**

Yaghootkar & Gil (2012) define schedule pressure as the gap between the project manager’s perception of work days necessary to finish a project with the resources allocated from the beginning of the project and the actual work days left before the planned completion date.

Studies by Griffin, Blichfeldt & Eskerod argue that projects in a multi-project setting absorbed by schedule pressure are recurrently delayed and causing an overall negative impact on the business performance (Yaghootkar & Gil, 2012). Furthermore, schedule pressure originates from settings where specialized resources repeatedly switch between projects. Yaghootkar (2010) argue that management at senior lever or top level may resort to employing resource from parallel projects as short-term means to ensure that more important projects are completed on time. Consequently this results in lower productivity as the project size increases in an effort to overcome the delays in project delivery.

**Firefighting**

Firefighting is a practice where management put efforts to prevent projects from being late. In order to preclude the project delays, resources are quickly allocated to solve unexpected problems that are detected late project life. If teams fail prior to the initiation of a project spend enough time to agree upon crucial parameters discussing risk mitigation strategies, and uncertainties, firefighting can become a vicious cycle in the organization. This cycle can result in exhaustion, increase the risk of errors and burnout and the effects of firefighting can be detrimental to the organization’s performance. (Repenning, 2001).
Chapter 4

Case Study

In this chapter, a company description and interview results will be presented as a part of the empirical case study in this thesis. The company description includes an explanation about the organization in this study, their perspective on a project definition, and employment of project management models. The forthcoming part of this chapter is divided into sections based on the themes from interviews, occurring problems, and workshop. Subchapters, Project Initiation, Project Execution, and Project Closure, are designed as a combination of empirical data and interpretations, theoretical application, and analysis.

4.1 Company description

ABB Components is, as described in Chapter 1.2 Company background, a business unit comprised in the division Power Products, which is one of the five divisions include in the ABB group. ABB Components have since the early 1900s been producing and developing transformer components in their production facility in Ludvika, Sweden. Since the beginning of their production, ABB Components have been one of the companies that have coped with the development and are today recognized as a one of the world leading companies in the market.

In order for ABB Components to maintain a leading position and to evolve with the market, internal development projects are crucial. An internal development project is different to an ordinary sales project, most often emphasizing how in-house efficiency and productivity may be improved. One successful example is ABB Components reformation in their production facility. The aim of the reformation was to move away from traditional productions methods and move towards Takt-based production, inspired by the lean thinking often seen in the automobile industry. The objective being to increase productivity by 30 percent. In addition to ABB Components introduction of lean thinking in their assembly line, other business developing activities that are supposed to improve their competitiveness and customer satisfaction have been implemented during the last few years. Amongst others are the introduction of the project management model PPS and a 4Q-model that is used in order to facilitate problem-solving processes concerning everything from quality problem to customer complaints. Projects run under the PPS model are usually conducted with stricter formality
and documentation while 4Q tend to have more varying degrees of documentation and formality. The PPS projects usually entail several steps of documentation throughout the process, while 4Q usually requires fewer steps. It is by this concept that smaller project are at times better suited to and adapted for using the 4Q requirements. However, a particular reason for this might also be the fact that the 4Q concept has been utilized for a longer period, and is, therefore, more well-known and adapted to fit projects.

4.1.1 Project Based Work

Projects are differently addressed depending on the size, project time, budget and available resources. Moreover, the definition of projects is differently defined depending on the type of role of the respondent. There are smaller projects which are run by a single department, or larger projects which span across departments or even subunits. There are projects which are more formally defined with a detailed plan and a set beginning and end time, while some projects are more loosely ran. The ‘undefined’ projects are often pivoted around smaller projects, which could be quick fix solutions.

For instance, a line worker might discover that repositioning of an instrument might improve the lead time in a line by a specific amount of time. The worker, therefore, reports this to his supervisor who in the latter stage implements this change among the workers in the line. This can be defined as a formal project, in which an issue is identified, or an opportunity is found. However, the sheer amount of documentation and formality may be of irrelevance or even obstructing the worker on the line. From an outside perspective, this undefined project which has risen from the workers operational work, could have been documented and therefore taken into account for later use in revision of the worker’s situation. The knowledge or experience, in this case, is mostly captured through the worker and the supervisor. However, it is suggested that these smaller projects are to some extent documented and accounted for, since it underlies the aims of the organization’s goals of reaching a set number of projects throughout a period. It is expressed that even with smaller projects which are more loosely run and of a lesser significant impact, there is a clear relation in which the employees in their everyday operational setting are engaged to change and improve the workplace. This commitment is of importance since it entails that workers who are not at a managerial level have an opportunity to change and improve the setting in which they act.

Another example of projects which are not formally defined are some projects that are concerned with security risks. Security is a top priority. Therefore, a group of workers do not need to be employed formally to make a plan and a case in which the risk is countered. If a reason for a risk is known, and if there is a solution available or easily reached, necessary action
can be taken without a formal making of a project group and plan. There are projects in which risks have been identified, and in which the managing is more complex, in these situations, a project is usually formed, and a group is usually employed to tackle the issue. However, it is important to note that while the initiation of a security project is not always strictly formal, the closure and ending is of uttermost importance. Therefore, the documentation of these security projects should be is written and stored no matter what, in order to make sure that relevant information concerning the risk is accounted for.

It is clear that there is not a common definition among the respondents of what a project is. Some common characteristics of a project are stated as; a project is goal orientated with a purpose and a set resource unit and that it is limited to a timeline, with a beginning and an end.

### 4.1.2 Project Management Models

As a result of ABB Components continuous multi-project work procedure, is it crucial that a common, effective and user-friendly project management model is implemented throughout the organization. ABB have in later years been using a model called *The Gate model* as their project management model, but as of today, ABB Components are mainly using a newer and more compatible model called *The PPS model*.

The Gate model was introduced globally at ABB due to an identified need for a common and manageable way to manage projects. The idea with the introduction was to create a structured and standardized model for project management with a focus on investment control. A proper utilization of the model secures that the project supports ABB strategies and objectives, delivers the expected product, within budget and on time. This is possible since the Gate Model via strict guidelines ensures that both the steering committee and the project management have a clear idea about how to proceed with the project in order to limit risks, as well as ensuring that decisions are made in time and in a correct way.

Tieto’s PPS model have several similar characteristics, but the main operational difference is that the PPS model instead of concentrating on investment control is used as a complete project management tool. Comparable to the Gate model is a project conducted using PPS divided into phases with gates as separation. However, with the difference that depending on your roll in a project, the phases and gates are varying and this is illustrated in figure 2. ABB Components are currently using the PPS model mainly in medium to larger internal development projects, where an experienced project manager in conjunction with the PPS model increases the potential for a successful project. The project success rates are increased
since the model creates a structured management plan for everyone involved, as well as emphasizing the importance of documentation and communication throughout the project.

Figure 2 – Visualization of phases and gates in the PPS model (retrieved from ABB Components)

*Steering committee* is a group of individuals with authorization to take all necessary decisions during the project. The steering committee are initiated to a project by the project owner and their first task is to create project directives, select project management and present the material. Throughout the project the steering committee are obligated to be available and supportive to project management, and if necessary engage in decision making processes which facilitate project progress.

*Project management* is a group or individual selected by a steering committee which have the objective to determine *what* and *when* tasks are performed. Project management’s work is initiated when the project directive is presented by the steering committee at the beginning of *Gate 0*. This also initiates the first phase of the project, *Preparation*, which besides an introduction of the project directive also includes project managements work to define what the result from the project will be; find objectives and delimiters, organize a project group, and describing work methods and risks. During the *preparation phase* the project management are also obliged to undergo gate 1, where the whole project team is aligned and necessary actions are taken. At the end of the *preparation phase*, in gate 2, the project management will present a project plan to the steering committee which then decides whether to continue or not.
If the decision is to continue, the second phase, *Execution*, is initiated with the objective for project management together with the project members to execute the project and produce the expected result. During the completion of this phase, gate 3, 4 and 5 are being performed, in all of these three gates the objective is to give and process feedback which are used both as enhancement as well as to discover any need for change at an early stage. As accomplishment of the *execution phase* the project result is transferred to the project owner.

The last phase is *Conclusion*, the objective for the project management is to create a final report that can be used in future projects. Included in the report are, amongst others, an evaluation and description of how the project has gone, if the project fulfils the objective, and important experience gained.

During the project life are the project managers expected to proceed thru of each of the eight gates, *show in figure 2*. The gates work as control stations for decision making and handling of project, the features of each of the gates are described below:

- **Gate 0 – Agreement to start project**: The primary objective is to make an early review of the project and address questions. A case is formed with a feasibility study regarding the current situation, during this meeting the steering committee and project sponsors are informed about the objectives, the estimated time, budget requirements and the scope. The project idea is reviewed and questions regarding the project are dealt with.

- **Gate 1 – Agreement on project scope**: The objective is to make sure that parties are agreeing on the scope, objectives, budget and timeline of the project. This agreement is achieved by a dialogue between members, discussing business needs and analyzing the current situation.

- **Gate 2 – Agreement on requirements**: This step is concerned with the requirements of the business case. The goal is to reach an agreement whether the project is described in enough detail to proceed. For this objective to be reached, risk factors have been re-evaluated, resources identified, costs updated and case assumptions refined and validated. Additionally, standards and architecture are identified and added to technical requirements.

- **Gate 3 – Agreement on design**: The objective is to reach and an agreement on system design and architecture. Furthermore, to ensure that activity planning is done for the business case and that costs and risks are analyzed. It is also important to assess appropriate architecture experts.

- **Gate 4 – Agreement on product readiness**: This gate is designed to confirm that the tested solutions are ready for piloting. Some steps included in this part are; defining integration and test plans, preparing operation and maintenance material, and finishing user manuals and training materials.
• **Gate 5 - Agreement on release:** The primary reason for this step is to confirm that the solution is verified by the pilot test, the business case is realistic and that the implementation plan is sufficient. This step is completed by finalizing the implementation plan, assessing and improving implementation readiness. In addition, it is important to prepare training for the organization and making sure the organization is committed to the implementation plan, in terms of resources and costs.

• **Gate 6 – Finalize implementation according to scope:** The purpose here is to reach an agreement if the implementation plan is completed and if the project can be formally closed. Some steps included in this are; properly archiving project documentation, comparing real usage of solutions and benefits with the forecast used in the business case. Additional steps are to plan monitoring of operations, usage, benefits and stakeholders satisfaction.

• **Gate 7 – Follow-up on project results and benefits delivery:** The objective is to make sure that the business cases are running as intended. This is reached by evaluating the implemented solution, and also assuring that lessons throughout the process have been utilized. To facilitate this, user experiences are gatherer and compared to the business case forecast. Lessons learned have been documented and are ready for use in upcoming projects if necessary.

The decision-making process in a gate consists of the central stages, *Gate assessment* and *Gate meeting*. As shown in figure 3. The Gate assessment is performed by the project team with the objective to gather all relevant information that ensures that gate related decisions can be made at the Gate meeting. This is a crucial part of the decision making since the purpose of the upcoming Gate meeting is to confirm, and not to analyze information. During the Gate meeting the objective for the steering committee is based on the *Gate assessment report* ensure that the investment are still viable and that all concerned units are aligned and agree about the upcoming steps and the overall project goals.
A Gate meeting can reach three different conclusion, depending on the project itself and the Gate assessment report. If the information in the report is insufficient, leading to difficulties with decision-making, a more extensive report is requested, and the process is repeated. If the information in the Gate assessment report is adequate, there are two possible outcomes. Either to cancel the project, or to proceed to the next phase. Since, there are several different gates taking place during the project process the risk that a project should be cancelled in a late phase is almost non-existent.

4.1.2.1 4Q model

This model is developed as a tool used to address issues internally and externally, in order to make business improvements. The main purpose is to provide a systematic tool used for approaching improvements, with the goal of ensuring solutions that are quickly implemented with permanent results. The 4Q model is named by the four quadrants of the reporting template, with each quadrant representing a step towards improvement. The four central steps are: measure, analyses, improve and sustain. With each step comes a set of tools used to ensure that a step is handled properly and that the user is prepared for the next step.

Q1 – Measure: To be able to appraise an issue it is important that the identified issue is well defined. Is it clear what the issue is? What sort of impact will it have on customers and business? It is first after a problem is defined, that relevant data can be gathered regarding the issue dealt with, and work towards a solution can be launched.

Q2 – Analyze: The goal with this step to have a clear view of what the root cause(s) for the issue is. To be able to reach this, it is required that the team works towards identifying and verifying the causes for the issue. Once completed, the team can proceed by focusing towards finding a solution.
Q3 – Improve: Once the analysis is performed, the team is ready to begin working towards a desired solution. Once a solution is presented, it is required that it is tested and verified, to ensure that the problem is cleared.

Q4 – Sustain: If the presented solution is clear and verified, it is crucial to make sure that it stays that way. Therefore, it is important that the working team makes sure that the process documentation is changed. Once the process is changed, it is important to reach out to coworkers and train them towards the new process, as well as noticing if new issues have emerged. If changes are not sustained, gained advantages will be lost throughout time as the workforce is renewed. It is, therefore, important that new employees are taught the ways which are beneficial to the business.

Figure 4 – The 4Q process (retrieved from ABB Components)
4.2 Project Initiation

4.2.1 How to assess which projects that will be initiated

During interviews, it was apparent that there is a procedure for deciding which projects to run, but that it was somewhat dependent on different demands or which challenges were identified.

Projects related to product development are first and foremost based on an internal review that entails comparison of different parameters for decision-making. Some of these parameters are:

- Growth opportunity – Market growth
- Operative causes – Difficulties with manufacturing a certain product
- Quality – Is the quality sufficient or does it need to be improved?

With the parameters set, an evaluation is made to assess what can be achieved with the project. Product development projects are dependent on a project budget, which is based on revenue, and distributed for a year. In concurrence with the project budget, the development department are ordering projects based on available funds and demands within the market. This procedure is usually commenced by a product council which might identify a demand in the market which requires the products to be developed or changed to fit the market needs. In other cases, it is decided by the opportunity of making cost savings or generating a profit on the market, and ultimately increasing the revenue.

Internal projects related to business development are defined by opportunities to improve production or manage issues associated with manufacturing. For instance, if deviations in manufacturing are identified, the management team decide how the deviances are to be handled. From that perspective, it is common to decide which method is employed for handling the projects, such as, the 4Q model or PPS-model.

The different criteria can be summarized into the following points:

- Key performance indicator – A particular is not fulfilled or can be improved – For instance productivity
- Market demand – Which leads to either:
  - Change in production line – In order to stay relevant to the market
  - Change in a product – In order to manufacture the right products
- Opportunities or issues in manufacturing line - Which leads to either:
  - How can we utilize opportunities to improve? How can we manage identified issues?
Traditional literature on project management have treated projects as equal entities, with the mind-set of “projects are projects”, with no or little distinguishing between variables such as technology, risk, size and complexity (Shenhar et al. 2001). A Study by Shenhar et al. (2001) have instead employed an approach which is more project specific, which presents a clear distinction between different types of project, and managerial styles for handling them. Shenhar et al. (2001) stated that depending on what types of projects are ran, there are different criteria for success, or as they would like to call them dimensions of success. Shenhar et al. (2001) classify projects according to technological uncertainty at the moment of project initiation. The four levels presented are:

- Low-Tech projects are dependent on established technologies. For instance construction and road building.
- Medium-Tech projects are reliant on existing standard technologies but are to some extent integrating new features or new technology. Examples are improvements or modifications of recent products.
- High-Tech projects are based on mainly new technologies, which are in cases developed before the initiation phase of the project. Examples of these are the development of a new computer family or defense developments.
- Super High-Tech projects are centered on new or non-existing technologies, often developed during the execution phase of the project. These projects are mostly ran by few (most likely larger) organizations.

Their study intended to discover whether what roles different success dimensions have, depending on the type of project and further analyses if all dimensions are equally important across different project types.

The four types of success dimensions by Shenhar et al. (2001):

- Project efficiency: Short-term dimension stating if a project was finished within the propositioned budget and time schedule.
- Impact on Customer: This expresses the significance of meeting and working towards the customer’s requirements.
- Business Success: Is related to what kind of direct impact a project can make on the organization. From a business perspective one may ask, did it resulted in market share increase, sales increase, profits and incomes as projected. This dimension is also applicable in the perspective of internal development; better process performance times, cycle times, and quality improvements all which can evaluate the project’s impact on the organization.
- Prepare the Future: Long-term dimension, concerned with preparing technological and organizational infrastructure for future opportunities. Common questions are; “did we develop
new technologies and core competencies?” and “have we built skills that could be useful in the future?”

![Success Dimensions Diagram](image)

*Figure 5 - Success Dimensions, (Shenhar et al. 2001)*

In ABB Components case, there is a clear distinction among the goals of the projects, depending on whether the project is a product development project or internal development project (or project targeted at improving the work environment). A commonly prioritized dimension of the projects in ABB Components case is the first and traditional dimension of meeting time, budget and specific requirements. This, which is not a surprise, is also noted as a crucial requirement by Shenhar et al. (2001). In their research it is clarified that most project managers are certain that the foremost job was meeting the first dimension and that their performance would be based on that. But conversely, Shenhar et al. (2001) research has also shown that depending on project type, there is a varying emphasis on approaching these goals. However the first dimension of meeting time and budget is in ABB Components case related to the yearly budget allocated for projects together with the notion of the political organization described in ABB Components.

“The project managers are aware that the project will require a significant amount of time, but when the business case is presented, there is always a request for reducing the time to market [...]” Interview respondent,

The situation where a project manager is instructed to make a business case ordered by the project owner or resource owner. The project manager proceeds by presenting a plan, according to his knowledge and skill regarding the issue or topic. The plan which contains a budget and a timeline for the project is then presented to the management team which decides
if the projects shall proceed or not, and what funding will be available. During the assessment of the plan, the most common request is that in order to launch the project, the time required to seize the project goals have to be reduced significantly. This situation is similar to a phenomenon described by Yaghootkar & Gil (2012) which is schedule pressure, this means that it is a situation in which there is a gap between the project managers’ perception of days required and the scheduled days for the project.

This situation, as described by the respondents shows an example of the political organization, which entails that there are different notions about what is considered to be feasible criteria for a project, in terms of time and resources, or not. It is also mentioned that while the political organization may evaluate a project’s realization opportunities differently, the requirement of cutting the time to realization is used to make sure that ABB Components stays in line or surpasses the competition on the market. However as noted by Shenhar et al. (2001) succeeding in project efficiency is something that can be assessed during project execution and it might very well indicate that the project is well-managed and efficient, but, succeeding in the long-run is not always a guarantee. Furthermore, Shenhar et al. (2001) argues that increased competition and shorter product life cycles, along with time to market pressures, makes project efficiency a competitive dimension. This reasoning is in agreement with ABB Components strive for being on par or staying ahead of the competition in the market. This is further addresses by which means the companies utilize to remain competitive.

On the contrary, this is noted as an issue by respondents. A project which was initially launched with a cut-down budget or project time will throughout the project time be exposed to insufficient resources. During the initial stages of the project it may be evaluated as successful according to the first dimension. However, respondents mean that this results in challenges since it forms a situation in which projects are let “loose” in the sense that projects coped with challenges are simply handed more resources or more time to finish. The problem posed with this is then that instead of having prepared for the more resources required, the urgency impacts projects with shared resources. This impact can affect the priority of other project in the portfolio which could ultimately delay the project further or projects part of the portfolio.

It may be perceived that the first dimension presented by Shenhar et al. (2001) is the most prominent throughout all types of projects in ABB Components organization. However, as stated in Chapter 4.1.1 Project Based Work, depending on what type of project there might be other priorities which are considered. As noted, a project targeted at improving the work environment from a security perspective may not be required to pass through the same formal process of making a business case as a product or internal development project. This, since the security is top priority, and since the occurrence of making security improvement is not as
prevalent as product development, but rather more spontaneous. This project becomes then more focused on meeting the third or even fourth dimension presented by Shenhar et al. (2001), which is concerned with the future of the organization explicitly meaning that it makes sure that it can operate safely.

Projects devoted to internal development are often steered by the first dimension, since there is a limited budget throughout the year allocated for projects. Internal development projects are, however, more inclined to benefit the organization, with criteria such as improving the production-line of the factory (Shenhar et al. 2001). Thereby, some internal development projects may overrun the budget constraints and time required, but in the longer time span, be considered successful and beneficial for the organization.

Product development projects are both beneficial to the customer and the performing organization. The customer benefits gained by meeting requirements, which can be meet through improvements of products, or modifications of a product in a technological field (Shenhar et al. 2001). Organization benefits from product development can be accomplished from merits such as product improvements, or increases in the company’s product line (Shenhar et al. 2001). In ABB Components case, the customer benefit can be reached by the swift adaptions on the market, while meeting customer needs. While the market is characterized by products which are of varying technological level, overruns are in cases accepted, since there are situations in which it is more about staying ahead or in line with the competitors.

Shenhar et al. (2001) argues that project overrun is apparent in projects and is associated with the level technology, and they mean that most overruns occur in cases where there are technical difficulties and are therefore more likely accepted than in projects associated with lower technology. This is applicable in both internal and product development projects since overruns are accepted with more success dimensions accounted for than project efficiency.

4.2.2 Creating steering committees and project teams

Concurring interview findings indicates that there are an existing understanding about the process used for appointing steering committees, project management, and project members. The steering committee, also known as STECO, are selected by the project owner, and it is crucial that the committee possesses enough mandate to take decisive decisions in order to progress with the project. Common members in a STECO are project owner and resource owners just because they have enough authority to independently make decisions. The resource owners are responsible for all individuals in the project group, this means that the resource owner depending on the projects level of cross-functionality can be different.
managers with varying authority. For instance, if the project is performed single-handedly by the production department, the resource owners are the production department manager. In another case where several departments are involved in the project, the resource owner either are ABB Components manager or several department managers. When a STECO are formed they decide on a well suited project manager, which then jointly forms a project group from available resources with necessary competence.

ABB Components way of selecting steering committees and project groups are often based on guidelines from PPS-model, which have several similarities with other project management models used today. Recent studies on the subject suggests that even though these model are used, the knowledge about roles and responsibilities that are related to being a project manager, a member of a steering committee or project group are unclear (Elonen & Artto, 2003). Since project outcome in many cases determines how an organizations future will turn out, project management could with high certainty be held as one of the most important organizational activities. With this fact in mind, Kaulio (2008) proposes two types of project management; internal and external. Internal, is planning activities with focus on the project itself. These activities are in most cases performed by the project manager or cooperatively with other involved members. External management, refers to activities often performed by a steering committee for instance resource planning, project re-definition and project planning. First, his study suggest that the most common occurring challenges associated with project management can be divided into either internal or external related problems (Kaulio, 2008). Lastly, he emphasizes that in order to handle these problems every organization needs to have a common and clear instruction for how steering committees, project managers and project groups shall be formed and what their roles and responsibilities are.

4.2.3 Feedback and documentation

The importance of both feedback and documentation have appeared during the majority of interviews. A project were the feedback process is insufficient will likely experience severe problems in some of the projects phases. The authors of this study have based on interview findings, three different types of feedback, which has varying importance during phases of a projects realization.

- Previous feedback
- Continuous feedback
- Closure feedback
Previous feedback can according to interviewees be experience of some sort from a previous project that in some way facilitates the planning stage of a project. The most obvious sort is documentation, more specific final reports, from similar projects or projects with a similar execution that is used as previous feedback. In cases where it is possible to use knowledge of what worked, and what did not, the whole project planning phase and project initiation are simplified. For instance; project owners can with a high certainty form a steering committee with enough mandate, a well-suited project manager can be selected and a project group with sufficient experience and knowledge can be formed by resource owners and project manager.

Besides the selection of the included resources in a project, recent studies concludes that an extensive organizational knowledge base is crucial to present and future project success (Hanisch et al. 2009). However, still, one of the most important parts in this phase is that all the documentation, ranging from project directives and specifications to a completed project plan, can be produced with confidence. These documents have according to Hanisch et al. (2009) a clear correlation with project success.

Continuous feedback is feedback that throughout the project is used in order to elucidate if the project are following the predetermined time schedule, budget and specifications. Continuous feedback must be detailed but still concise just because managers, both included in the project and not, shall have the possibility to quickly get a perspicuous view of the project and based on that information realize if the project is progressing according to plan. Throughout this phase of the feedback process documents, if prepared correctly, from the initiation stage can be used. But it is even more important that all project members’ gather experiences about their own and the projects performance, and conserves it. Hanisch et al. (2009) present, based studies performed by Turner et al. (2000), that as many as 85 percent of project members gather some sort of new knowledge when working with a project. But only a small number of organizations have an implemented functional system for knowledge management and transfer. This fact constraints the last phase of the feedback process as well as limiting the whole organizations knowledge base.

Closure feedback are according to interviews the part of the feedback process that receives the least attention, even though it could be considered as a crucial part of a project. Closure feedback is the part of a project that most obviously enables knowledge transfer in the organization. According to the PPS-model, which in most cases works as the guidelines that ABB Components uses to manage projects, knowledge transfer is of the upmost importance. This finding is similar to what previous studies concludes. An organizations project management maturity is highly correlated with the ability to collect, store and finalize knowledge about a project (Hanisch et al. 2009). In order to develop and to secure that projects
in the future are performed with an increasing success rate, both positive and negative experiences from a project must be transferred to the organization.

Similar to the three feedback types identified in this study is the findings from Disterer’s (2002) work. He formulated a project as a task that takes places simultaneously as everyday work but with three types of knowledge transfer to and from a project. As shown in Figure 6, a project receives knowledge from previous projects, similar to our previous feedback. Continuous feedback could be compared with knowledge transfer to and from the routine organization during its execution. And lastly, Closure feedback is knowledge transferred to future projects.

![Figure 6 - Knowledge transfer to and from projects, (Disterer, 2002)](image)

Documentation, which is included in almost all aspects of the feedback process, have similar importance as feedback, it could even be considered as a higher valued component of a project. This is because a project without documentation most likely never will become fully finished and in some cases may produce a product or result that might harm the company. The PPS-model includes several types of documentation that during the course of a project are important to complete. In early stages of a project, there are essential documents, such as business case, project directive, specifications, and project plan, which must be prepared. All these documents but especially the project plan, are used throughout the whole process as a method to monitor progress as well as aiding project managers, among others, with planning and execution of the project. During the realization of a project, other types of documentation increases in importance. For instance, material that the project group prepares for gate meetings which are supposed to allow the steering committee to focus on decision-making instead of discussion about challenges and other project related actions. Documentation regarding decisions are also important. In upcoming events where uncertainty may occur about what should be done, a document that tells project managers about the decisions that
have been made, may in these situations reduce uncertainty and enable a more efficient management. In the closing stage of a project, the final report is the most important documentation. This report should include important parts from all stages of a project, such as; if the objective has been fulfilled, if the project is within budget and time, and also positive and negative feedback about execution which could be used in future projects.

Hanisch (2009) concludes that one of the key problems in project management is the insufficient documentation on the results of previous projects. The fact that project members, project managers and all of the involved individuals often neglects this important phase could be related to a circumstance mentioned by Disterer (2002). In his study, Disterer (2002) states that documentation of projects rarely contains valuable information for project members in following projects. As a consequence, this trend might be the reason for the lacking project interest for documentation from project members.

But, even though project members often can’t see the importance of documentation it would give managers an organizational advantage. Since properly prepared documents includes; methods and proceedings, precise problems, details of successful and unsuccessful solutions, mention persons to seek advice from and external experts, contain descriptions of successful cooperation’s and their success factors, hand down handling tricks etc. (Disterer, 2002) A project manager could uses all of the above stated as lessons learned, which hopefully would result in a more efficient planning and execution of projects.

### 4.2.4 Identified problems

Throughout the interviews, respondents were asked whether or not there were challenges related to work with projects and the process of running them. It is clear that from the beginning of the interview there were challenges that could be related to certain parts through the process. However, as interviews proceeded some particular challenges were common during more than one stage of the project.

Initiation of too many projects was a factor which had an impact during the planning stage, since it means that resources are spread throughout several projects. With project leaders participating in multiple projects, there is a risk of ambiguity. Which means that if it is unclear which project a resource is dedicated to priority concerns is eminent. If personnel are not aware of which projects are on priority or if resources have to be re allocated, future challenges will be that important projects in the execution phase will be delayed during different stages. Competition of resources is also relevant in this case, since it means that a limited pool of resources entails that the right resources for the right job are competing, in a way that it affects which project is prioritized.
Another issue stated was related to the yearly budget dedicated to projects. It is mentioned that while a budget provides framework of how much is available for spending, there is an issue related to employment of personnel. Since the budget is yearly and based on a revenue, it can be difficult to appraise how much next year’s budget will be. This means that for projects spanning longer time periods, planning of resources becomes an issue. A project may initially according to plan, have a criterion for how much resources are required, but as the project progresses the setting might change. This entails that in some situations more resources need to be allocated. This might have an impact on the future of the project, since it may be delayed due to not having adequate amount of resources at the right time.

The challenge with a yearly budget are associated with risk assessment. In particular regarding the employing of external consultants. It is stated during the interviews, that it is important to have ABB personnel responsible for running projects and being part of the crucial parts of the project. This, is to ensure that knowledge is kept within the organization. If an outside contractor is employed, his or hers main concern lies within finishing the project at the set time, whereas an employee of ABB also shall be concerned with the feedback and the passing on of knowledge gained for future work.

The process of selecting a projects steering committee and members might seem to be a task that should not bring problems to an organization. However, according to recent studies the sense of insignificance during this process is exactly what creates problems. The majority of organizations have a limited resource pool, and especially narrow is the segment of people that are perceived as the very best at their position. Elonen & Artto (2003) clarifies that a common occurring problem is that the composition of steering committees and project members is often too extensive and that the resources used is not optimal. In this case, this means that a few individuals with a high level of experience and knowledge will be selected for every project if they are available, even if their presence won’t bring that much extra value to the project (Elonen & Artto, 2003). One reason for this is that the roles of steering committees and project members might seem unclear and an overly experienced project group may create a false sense of security. A two-sided solution to this problem includes a more efficient use of experienced resources as well as clearer information about roles and responsibilities for the whole project team.

Even though the majority of the interviewees understand the importance of a working feedback and documentation process, most of them admitted that this process is insufficient. The type of feedback that the authors have named previous feedback, which is related to usage of the organizations knowledge base, is for example not used in a proper way. Project managers doesn’t use previous final reports in order to achieve lessons learn which would help with
project planning and execution. During the project execution phase, material for gate meetings are being prepared in a misleading way, which forces steering committees to focus on discussions and problem solving instead of decision making. Also, as the most significant factor, the final reports, are according to several of the respondents, often either not being written or are written to a deficient standard.

In their study, Todorovic et al. (2015) presents a proposed planning model that increases the chances for successful feedback and documentation process, and knowledge management throughout a project’s life cycle. This model extends the project plan by including a project success analysis framework. Their model includes two new terms in the project planning; Critical Success Factors (CSF) and Key Performance Indicators (KPI). Both these factors are included in the more extensive project planning and means that the project manager and team will identify factors that are especially important to the project, and thereafter come up with indicators that measures the progress of the CSFs.
4.3 Project Execution

4.3.1 The use of Project Management Models

Almost all interviewees share a common understanding on the project management model PPS, which is used locally at ABB Components. It is clear that the model has several advantages in some situations and that disadvantages may occur in others. Most of these pros and cons are related to project size. Interviewees explained that, especially in large projects that stretch over an extended period of time, project managers and the steering committee most likely would witness advantages associated with the thorough planning phase and continuous documentation recommended by the PPS model. The most distinctive advantages mentioned during interviews includes:

- Well-known structure
- Risk assessments and management
- Accurate specifications
- Detailed planning
- Documentation that facilities decision-making.
- A status system that allows managers and bosses to receive a general insight into projects.

In addition to the advantages mentioned related to large projects, several interviewees stated that small and medium sized projects are often conducted without a specific project management model. This fact is related to the disadvantages associated with the PPS-model. A common opinion is that small projects conducted with the full PPS model often would end up losing more than they gain. This is supported by the following disadvantages mentioned in interviews:

- Unrequired planning
- Unnecessary documentation
- Time-consuming activities

Even though the majority of our interviewees have stated that a full PPS model in small projects is pointless, several respondents have mentioned that it is up to the project manager to overcome problems related to the usage of the PPS model in small projects. Larson (2012) argues that small-scale projects have unique challenges in comparison with large projects. The challenges the she mentions are focusing on early and late stages of a project, and are often related to the limited project time frame. This may result in the temptation to skip the important planning process and immediately start executing the work, and during closing stages of a project totally exclude a final report.
The “skipping planning”-phenomenon most often occurs in projects which have similar tasks as previous projects. This means that a small but still important project may be conducted without a proper plan. Results may be that tasks are performed out of order, later or in the wrong way, which can lead to costly mistakes later on if the risks are not planned for (Larson, 2012). Some interviewees stated that the activities that are sometimes seen as unnecessary administrative activities, are not a side effect related PPS usage in small projects. It is more of a consequence of limited knowledge and experience from this type of management in small projects, which is in line with what Larson (2012) states about small-scale project management. An experienced project manager understands and focuses on the most important parts of planning, documentation, and execution even in the smallest projects. For instance, the seven required gate meetings can be reduced to a more reasonable amount, and this would at the same time require a more limited documentation during the project execution.

Although the PPS model has some oppositions at ABB Components, the model or a similar project management tool is a necessity in larger projects. Interviewees mention that PPS conducted projects shows in a clear way what is expected of all involved individuals, as well as the project itself, and this is why the PPS model should be used more frequently.

### 4.3.2 Resource planning

It has been previously illuminated that the market in which ABB operates is highly competitive and many times personnel are required to be part of multiple projects. The project leader and the resource owners aim to evenly distribute the resources in a practical way which mean that people are able to work full-time or full-work days if possible with projects. However, distribution of personnel varies depending on what type of project is being undertaken. Yaghootkar & Gil (2012) use research from Rosenau (1998), Crawford (1992), Canonico & Söderlund (2010) and Geraldi (2008) when he states that this is a part of the competitive environment and in order to be able to survive on the market addressing several projects simultaneously under time pressure is a necessity.

From interview data, it is apparent that resource planning is more or less handled by the resource manager and the project leader. For the research and development department (R&D) the resources are mapped to present an administrable framework for resources. The resources in R&D are in most cases scheduled for a single project in order to avoid collisions between projects. Internal development projects are not as strictly planned as R&D, and it is more of a responsibility of the manager to keep track of the resources. Resources from internal
development projects more frequently participate in multiple projects, depending on competence or skill.

For instance, a logistics manager or someone responsible for logistics is usually participating in more than one project since it would be inefficient to have one logistics manager for each project. This means that the logistics manager's workdays are usually not scheduled for full days, dedicated to a single project. Thereby the logistics managers' task are often less time-consuming or varying, and often related to assisting several projects at a time.

An employee working for the R&D department is often involved with a task which is more orientated towards a single project, generally associated with one task or one product. Therefore, scheduling a resource working with product development for R&D, can be facilitated through a schedule planned with full workdays dedicated to single projects. The task is often technically complex and related to a single product, and therefore is it beneficial for the employee to focus on a single task throughout the day. However, this does not imply that every employee working on internal development projects is at all times scheduled for more than one task during the day. At the same time, a member of the R&D department is not always working single handedly with one task during the workday.

Similar to the R&D's mapping of resources, the production technology department is using a tool for handling resource planning, a so-called visualization board. This tool provides a clear overview of the employee's workload throughout the day while enabling the manager or resource owner to plan and dictate the workforce.

Some general points that can be noted from resource planning are as follow:

- Project leader and department manager (resource owner) are usually responsible for planning and selecting resources for a project.
- Planning of resources in between projects can be difficult, and it is the manager's role to prioritize the workload. If there is a conflict between everyday work and a project, there needs to be a clear priority as to where resources are required.
- Project leaders and resource owners strive to plan and distribute resources for complete workdays, to make sure that resources are dedicated to a task for project.

4.3.3 Identified problems

A limited pool of resources means that the planning of personnel has to be performed in terms of numbers of whether or not someone will work full time, half time or even twenty-five percent. A lack of resources might be due to people being ill and, therefore, absent, or insufficient funds required to employ personnel for the project. This means that during the
initiation of a project there are difficulties with employing personnel for the designated projects. The forthcoming period of the project, which is the realization of projects, this means that there is a lack of resources throughout the project. If there are projects with apparent challenges or problems, more resources will be allocated towards those particular projects, which primarily affects projects with lower priority. However, the lack of resources will initially have an impact on projects unless they are prioritized. However, a lack of resources in combination with projects which requires further aid will further impact projects with lower priority.

One respondent presented an occurrence which causes a problem that ultimately affects a project’s realization time. It is a problem where the project is being accepted with a to-do list throughout the stages of the PPS model. While the problems are being overlooked during the earlier stages, the end phase in most projects entails a list of unfinished issues which requires attention. This can result in two challenges; the project needs to be finished and therefore resources are captured from concurrent projects in order fulfil the to-do list, or the project itself has reached the end-phase and the priority of the project has lowered, and therefore it is even further delayed rather than being completely finished in time. Yaghootkar & Gil (2012) research data suggested that there may arise a sense of urgent action which affects decisions to prioritize projects. It is described as a phase where project delays in relation to planned progress may be overlooked in the early stages, but as the deadline is closing in the attention increases dramatically. This means that in ABB Components’ case, there is a low urgency to capture resources from concurrent projects in the early phase of the project, but, conversely it almost escalates exponentially as the project unfolds, if a potential problem or delay is expected but no action is being taken. Yaghootkar & Gil (2012) present in their study a simulation of the effects delay in project start have on a following project. If a project is delayed, it will be prioritized and therefore use even more resources from project 2 (more resources meaning that resources are already shared to an extent between projects). When project 1 reaches its end-phase it will become a lower prioritized project and then starting to let go of resources. However, since project 1 had to allocate resources from project 2 which has reached mid-phase, project 2 has then to be prioritized in relation to project 3, and therefore capture resources from project 3 (Yaghootkar & Gil, 2012).

Other interview responses regarding this have been related to smaller projects, a particular example of this is; if there are two people working 100 percent with one project, and one leaves, then 50 percent of the workforce is absent. If there would be 100 people in a project and one member would leave, it would not have as big of an impact as in a smaller project.
Project participants are working part time with projects and at the same time working with daily work. A worker endorsed to work 50 percent can sometimes be dedicating less time if there is an unclear definition of how much work is actually needed. Another reason for this is also exemplified in which one respondent states that individuals may have different priorities depending on numerous different reasons. By that, it is meant that projects can be put aside for work that is their primary task.

Studies by Wheelwright and Clark (1992), Cusumano and Noboeoka (1998) mean that employment of full-time resources tend to perform better in comparison to those working half-time or part-time, since less time is spent on non-value activities such as finding and remembering information (Yaghootkar & Gil, 2012). Everyday work together with time consuming project work required by high level schedule pressure can be taxing for the employee and can if prolonged cause stress and health problem that can negatively impact productivity (Yaghootkar & Gil, 2012). At the same time Abdel-Hami (1998) highlighted that teams with over commitment are more susceptible to error that further prolongs the project due to rework that needs to be done.

There have been responses regarding risk assessment which is related to technical difficulties. During the initiation phase, it was noted that it might be difficult to assess risks which are related to the market structure and development of technology. For the realization phase of the project, this means that unanticipated changes in the market can have a direct impact on current projects. An unanticipated or ‘too’ early change in technology forces us to adapt quickly in order to be on par or beat the competition with better technology and prices. For instance, if transformers suddenly should be slimmer, there is an opportunity, and we, therefore, need to act immediately. This was an unplanned shift for the project and an unanticipated premature shift in technology. This raises an issue if the company, for instance, has sold a product that is not entirely adapted to the sudden change. In that case, the components are not entirely finished. Initially the prognosis was a bit optimistic, looking at the adaption and change in the future. But the sudden change arrives, and then you’ve got to be in on it.

Other challenges that have been noted is the risk of making a product that is not fit for the manufacturing line. This risk originates in the divide between the departments of the R&D and the production department. The rising challenges, in this case, means that the product developed is more of a ‘conference room product’ rather than a product which have the right circumstances to be manufactured. This particular issue is due to personnel from the production department not having participated in the different stages of the R&D project.

This also holds true for both the initiation phase and closing phase for the projects, since it might at times not be accounted for during the initial phase of the project. For the realization
phase, challenges might not be accentuated since a project which is considered closed for the R&D department, might be considered running and not finished for the production department, responsible for manufacturing. For the realization phase, this means that the R&D project working with development might not have had the sufficient resources and time to finish the project, which is connected to challenges of scarce resources or allocated resource.

Risk assessment in general is something difficult to account for, especially if it is related to the market structure, however, it has been noted that there is a need for a more structured risk assessment, in which risks are correlated to possible outcomes depending on what type of projects are run. It has been noted that this is something to be accounted for during the initiation phase as well as the realization, and it is to some degree the steering committee’s responsibility to pursue this. While it is partly the committee’s responsibility to follow this, the risk assessment can put demand on the project leaders, since it entails knowledge and experience regarding the certain projects and technologies involved. The issue with this is then related to the limited resources and the competition for resources. Every project leader might not have the same prerequisites for leading a project, in terms of experience, skill and knowledge and therefore making a thorough risk assessment may not be possible or top prioritized.

A usage of a project management model, such as the PPS-model, in larger projects is according to interviews exclusively an advantage. One respondent stated:

“All projects conducted with the PPS-model will have an increased potential for success. I believe that it is impossible to blame project failure on the PPS-model if it used in a project.”

In comparison with the entirely positive thoughts about PPS usage in large projects is the small-scale project management. Several interviewees have mentioned that a “PPS-model light” is available, but that project managers are still free to select whether to use it or not. Even though it is positive that there is an existing model for the managing of small-scale projects, this might also be a problem, since, it is likely that these types of projects will be performed without planning and sometimes even without a project manager. Project conducted without a manager have according to Larson (2012) a considerably lower success rate. 97 percent of the successful projects have a formal project manager and out of the projects with challenges 78 percent were conducted with a project manager.
Larson (2012) maintains her opinion that all projects need a proper planning stage and a formal project manager which is in line with what Cervone (2005) implies. All stages in a project have some aspects that frequently are overlooked. Often a manager from the beginning choses to only focus on the executing phase of a project and thereby downgrading the rest of the phases. If this is the case, figure 7 shows a typical distribution of resource in a project. It is clear that even though the execution phase of a project might seem to clearly be the largest part, the remaining processes have a significant level of resource activity and importance for the project. (Cervone, 2005)

![Figure 7 - Typical resource usage within the project lifecycle, (Cervone, 2005)](image)

Since it is the less prioritized processes, initiating, planning, controlling and closing, which mainly are included in the guidelines from the PPS-model, a project conducted with less focus on these parts or even without the project management model may witness challenges related to planning, control and closing. This may result in:

- Inadequate planning.
- Lack of controlling mechanisms
- Project closure problems
4.4 Project Closure

4.4.1 Knowledge transfer

A recurring point mentioned during interviews is the limited documentation on knowledge transfer in the final stages of a project. One interviewee explained that knowledge more often than not is something that every individual keeps for themselves. For instance, a project manager takes notes about the experience from a project, but then does not always share the experience with the rest of the organization. According to “guidelines in gate 6 and 7 in the PPS-model, a final report and a follow up on the project is mandatory, but this is something that is often overseen in projects that lack either a driven project manager or have a high importance for the organization. Another reason for the lacking knowledge transfer is related to the generally small project groups in projects conducted at ABB Components which may lessen the considered value and knowledge transfer.

All identified reasons for the deficient knowledge transfer at ABB Components have previously been identified in studies, and can therefore be seen, to some extent general phenomenon in organizations. Disterer (2002) mentions in his article about project management some reasons for the general lack of knowledge management and transfer. After finishing a project team members, and thereby knowledge, are spread over the organization. Important documents and thoughts about experience from projects will as a result fade and problems with retaining this knowledge in final reports and upcoming projects occurs. As an addition to this problem is the now common to employ consultants for a project based timeframe (Disterer, 2002). Even though, the employed consultant might be better suited for the job than any of the ABB Components employed personnel, this may lead to a loss of important knowledge and experience if the consultant is used in an important role in a project. As one interview respondent mentioned:

“It is of great value that important project roles, such as project management, are handled by, internal manpower. An external consultant may in some cases harm the future of the company when knowledge and experience that could be used in future projects are lost after the project ends.”

A major aspect of knowledge transfer is correlated to the universal lack of feedback and documentation in projects, mentioned in Chapter 4.2.3 Feedback and documentation. For instance, when the documentation and feedback processes in a project are deficient, the result will most often be that a project manager who in general has the responsibility to finalize a
final report may be missing the project team’s combined experience about important learning that could help future organizational events and projects.

4.4.2 Project handover

The delivery of a project or handover stage is a process described as an agreement between the product development department and the production department. This agreement means that a project which is finished in one area is ready to be handed over to the next. Practically, in a case like a product development project this means that the product is; developed, tested and ready for manufacturing, and that it is now the production department responsible for the next stage, which is to manufacture the product.

This end phase of the product development project, usually occurs during the fifth, sixth or seventh gate of PPS-model. The handover of the project is dependent on; budget, if the project is on time, and if the criteria for the product is fulfilled.

The budget is the deciding factor of how much resources are available for the project. Therefore it requires that a sufficient budget is available to make sure that the project is finished on time. However, a project phase is not linear, meaning that going from a product idea to a finished product does not always go according to plan. As noted in previous subchapters, there are challenges which may arise during the process, that in different ways impact on the project. This may be issues obstructing the process, more resources are required to make sure that the project is finished, and likely to be either more personnel need to be assigned or more time given to project. Since the project is limited by a budget without an infinite amount of resources, the process have to end at some time.

The stage in which the production department is responsible for taking over the product is somewhat unclear. This ambiguity or uncertainty is originated in the unclear agreement of what is decided as finished.

For most product development projects, the product is considered finished during the fifth gate, which means that it is tested and working. The main deficiency or misstep may be due the unsuccessful realization of the finalizing steps, which is the zero-series. There is a difference between testing a product to see if it is operable and testing a product to see if it is fit for production. Since most products are developed and modified according to different demands, there are variations in the products. These variations means that the production-line in some cases has to be customized in order to be able to manufacture the desired product. When the zero-series are run, it means that a number of products are being manufactured on the line to make sure that it is feasible according to demands such as, units of time and cost.
per unit. Without the zero-series a crucial step is missed adapting the production plan to the new product.

Since the product development project are working according to a budget and project plan, finalizing the project in time can appear to be more important, and therefore the project can be considered finished by the product development department when the product is tested. Ideally, the product is beyond tested which means that all gates are fulfilled and the zero-series are ran. For the aftermath this means that the production department is supposed to manufacture a product that is not fit for production. The project for the development department is marked as complete, while the production department have to cope with challenges. This unfolds a chain of events since, the development department released a product not fit for production, and the production department have to allocate resources to address issues with customizing the line to make it fit for production.

Studies by Dvir (2005) mean that project termination or project close-out is something that is overlooked, and that a plan should be formed in order to properly terminate the project. The termination process is considered difficult as it may involve several aspects for consideration, including; ensuring client’s acceptance of the project; creating a final report; making sure there is product support; and redistributing resource. The process should be integrated into the life cycle of the project and therefore planned, scheduled and budgeted like other activities in the project life. Dvir (2005) further states that there are several studies focusing on project termination while less focusing on the termination activities and the impacts on project success. Furthermore, his study focused on three criteria for project success; project efficiency, customer benefits, and overall success.

Dvir’s (2005) study shows that effort made on planning and preparing the commissioning of projects has a direct impact on project success in terms of project efficiency and customer benefits.

- All planning and preparation efforts have a positive effect on project success, with final user preparations and escorting team being the most significant.
- Project efficiency is strongly related to the participation of the escorting team and final user preparations for the commissioning of the project.
- Customer benefits are primarily affected by final user preparations.

Additionally Dvir (2005) provides suggestions for improving the chances of a successful commission of projects. If there is a team is assigned to handle the development and another team responsible for planning and preparing the project commissions, the end user can have
a greater impact on project success. The end user’s effort will have a stronger influence on the project’s success than activities performed solely by the developer (Dvir, 2005).

The main concluding remarks from Dvir’s (2005) research indicate that projects under contract for internal or external customers, should be allocated resources in advance for the hand-over phase. Thus, utilizing customer involvement in all stages of the project will more likely be beneficial for the project efficiency and project success.

4.4.3 Identified problems

Challenges related to knowledge transfer are often invisible until a severe problem occurs or a solution for handling the transfer is implemented. This is due to the fact that it is not until then that the organization recognizes that they have been “reinventing the wheel” throughout several past projects (Disterer, 2002). If a project related problem or solution occurs in an organization with an inadequate knowledge transfer culture, it will only be the specific project manager and project team that knows about it. If then in a future project a different project manager and team faces a similar task, the solution or problem will most certainly not be recognized. Therefore, the whole process of identifying the problem or solution will be repeated. ABB Components seems according to the information gathered during interviews to be an organization with indications of a knowledge transfer problem. The “reinventing the wheel”-syndrome is therefore likely to apply to projects at ABB Components. This statement is based on the fact that the majority of the interviewees mentioned that the knowledge transfer, which mainly takes place in the later stages of a project, is a low priority task. There are several possible reasons for this but the most obvious ones mentioned during interviews are:

- A loss of interest in later stages of projects
- No established method for knowledge transfer

These reasons, combined and alone, will have an influence on the organizational project performance. Managers, project managers and project members will have to spend time trying to figure out possible shortcuts in, for instance; project planning and execution. When the information about these shortcuts would have been available at the start of the project, and if the transfer of knowledge taken place. If nothing changes in the way the organization handles knowledge this may occur in some way in all future projects.

Several of the respondents reported similar challenges of problems related to the delivery of a project or handover stage.

- Not enough time to close projects, due to too scarce funds.
• Laid-off or quit their job, there is a great risk of losing knowledge.

The most noticeable problems in the closing stage of a project were related to the handover phase. Respondents have informed that there are gaps in the handover stage of the project and mean that the project owner does not require zero series, which results in that the production system is not fully ready for the new product. Another respondent have informed that a communication plan is important and states that there are often times where a project is closed or handed over with too many actions on a to-do list. This is often a result of the budget process, since the project is under a tight schedule due to limited resources. Ultimately, this affects the unit which receives the project when they need to redo missing steps in the project. Respondents have stated that this should not be an occurring problem, due to the fact that a project owner should not be allowed to accept a project unless it is completely realized.

### 4.5 Occurring Problems

Problems related to project portfolio management that occurs in multi-project environments seems to be a rather well known phenomenon. A list containing the main identified problems, possible causes, and consequences are presented in table 1 below. Both previous studies, and the organization in question have a clear understanding that difficulties associated with management is common. It is also this awareness that makes it possible for ABB Components to strive for a change. However, the current culture and organizational structure implemented at ABB Components makes a change difficult, but still possible to apply. The majority of involved personnel must understand, and be willing to, achieve a more effective project management, focusing on causes for the identified problems in all stages of a project.

*Table 1 - List of problems*

<table>
<thead>
<tr>
<th>Project phase</th>
<th>Problem</th>
<th>Possible cause</th>
<th>Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiation</td>
<td>Initiation of to many projects</td>
<td>An organizational drive to conduct &quot;all projects&quot; instead of &quot;the right projects&quot;</td>
<td>Overloading an already limited resource pool. Individuals are required to participate in concurring projects</td>
</tr>
<tr>
<td>Phase</td>
<td>Issue</td>
<td>Problem Description</td>
<td>Result</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Initiation</td>
<td>Different notion regarding feasible criteria for project realization</td>
<td>Different opinions regarding time and budget. A higher focus on time-to-market and short product life cycles results in schedule pressure</td>
<td>Persistent problems throughout the project phase, which results in a demand for more resources. Priority in the project portfolio are affected and may result in further delays for the project in mind and concurrent projects.</td>
</tr>
<tr>
<td>Initiation</td>
<td>Inefficient forming and usage of steering committees</td>
<td>Unclear directives about roles and responsibilities.</td>
<td>The decision making process may result in discussions regarding technicalities</td>
</tr>
<tr>
<td>Initiation</td>
<td>Too extensive project teams</td>
<td>The belief that an overqualified project team better manages a project combined with an excessive need to complete projects.</td>
<td>Project owners and managers are competing for highly skilled individuals. This affects which projects are prioritized</td>
</tr>
<tr>
<td>Initiation, Execution, Closure</td>
<td>Insufficient feedback and documentation</td>
<td>Inaccessible documents and about present and previous projects. Unclear structure regarding documentation.</td>
<td>Steering committees may witness difficulties with decision making, due to limited information about the project. Project members’ insights and experiences may be overlooked in final documentation</td>
</tr>
<tr>
<td>Initiation, Execution, Closure</td>
<td>Inadequate usage of project management models</td>
<td>Lacking knowledge, regarding both when and how to use PPS</td>
<td>Project managers may end up run a project without a proper project management model. This may result in insufficient management.</td>
</tr>
<tr>
<td>Execution</td>
<td>Projects accepted with a to-do list</td>
<td>Limited time and budget forces projects to a premature deadline.</td>
<td>When the project needs to be finished resources from concurrent projects are captured.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If resources in the closure phase are released the project closure will be further delayed.</td>
</tr>
</tbody>
</table>
Table 1 presents 11 problems that were identified during interviews. Furthermore, the problems are divided into the different project phases that previously have been introduced. These problems are identified as challenges that in some way affects the efficiency of ABB Components project portfolio management. Even though, all problems have an individual assigned cause, we were able to find a pattern which allowed us to reduce the 11 potential causes into four possible root causes. These root causes are as following:

- **Limited resources**, in the form of a limited available resource pool.
- **Limited resources**, in the form of a restricted budget and timeframe.
- **Vague directives**, mainly emphasizing the insufficient knowledge about roles and responsibilities required for project management.
- **Project maturity**, related to organizational culture and structure when it comes to project portfolio management.

The 11 problems presented in the previous segment are also analyzed in order to find their correlation to the root causes, table 2. This is based on facts gathered during interviews and information from previous studies regarding similar cases.
### 4.6 Workshop

Discussion during the workshop confirms that the problems that we have identified actually may occur in projects or project portfolio management ABB Components. The theoretical based opinion about the problems are in a large part of the cases relatively accurate, a difference of less than ±1. But in 17 of the 44 different relations we can witness a difference
between the theoretical based value and the opinions from workshop attendees that are larger than ±1. This is shown in figure 8, were the relations with a big divergence are presented as red. The calculations behind these values are the theoretical perceived opinion minus average workshop opinion.

Table 3 - Difference between theoretical perceived values and workshop attendees’ opinion

<table>
<thead>
<tr>
<th>Problem</th>
<th>Limited resources (Personnel)</th>
<th>Limited resources (Budget &amp; time)</th>
<th>Vague directives</th>
<th>Project maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiation of too many projects</td>
<td>0,8</td>
<td>0,7</td>
<td>-0,5</td>
<td>-0,3</td>
</tr>
<tr>
<td>Different notion regarding feasible criteria for project realisation</td>
<td>0,5</td>
<td>0,8</td>
<td>-2,3</td>
<td>0,2</td>
</tr>
<tr>
<td>Inefficient forming and usage of steering committees</td>
<td>1,7</td>
<td>0,5</td>
<td>1,0</td>
<td>-2,5</td>
</tr>
<tr>
<td>Too extensive project teams</td>
<td>2,5</td>
<td>0,2</td>
<td>0,7</td>
<td>-2,0</td>
</tr>
<tr>
<td>Insufficient feedback and documentation</td>
<td>0,2</td>
<td>-0,3</td>
<td>0,7</td>
<td>0,3</td>
</tr>
<tr>
<td>Inadequate usage of project management models</td>
<td>-1,5</td>
<td>-1,0</td>
<td>0,7</td>
<td>0,8</td>
</tr>
<tr>
<td>Projects accepted with a to-do list</td>
<td>0,5</td>
<td>-0,3</td>
<td>0,3</td>
<td>-1,2</td>
</tr>
<tr>
<td>Resource allocation</td>
<td>0,2</td>
<td>-1,5</td>
<td>-1,3</td>
<td>0,0</td>
</tr>
<tr>
<td>Deficient knowledge transfer</td>
<td>-1,8</td>
<td>-2,3</td>
<td>2,3</td>
<td>-0,2</td>
</tr>
<tr>
<td>Zero series is limited in the project phase</td>
<td>-2,3</td>
<td>-0,3</td>
<td>0,2</td>
<td>-2,2</td>
</tr>
<tr>
<td>Project close-out (handover)</td>
<td>-2,7</td>
<td>1,5</td>
<td>0,5</td>
<td>0,0</td>
</tr>
</tbody>
</table>

One major difference visible is that the theoretical opinion on the effects of limited resources in the form of personnel, is quite unlike the workshop attendees’ perception. Where in most cases they have undervalued the effects of a limited resource pool. Similar to the theoretical and practical difference in opinions about limited resources is the thoughts about project maturity. Based on previous studies our conclusion was that project maturity in some of the problems had a large correlation, but from workshop results is it clear that the project maturity in ABB Components case probably were a larger cause than expected.
• Different notion regarding feasible criteria for project realization
  o A more significant relation to vague directives, since it was a common opinion that there are difficulties in categorizing projects. And even more so, when it comes to defining what task should be handled as projects.

• Inefficient forming and usage of steering committees
  o Workshop results points towards less relation to limited personnel and higher relation to project maturity. This is because the organization as a whole mismanage the attitude and knowledge about what steering committees are supposed to do and when.

• Too extensive project teams
  o Extensive project teams is the problem with the least recognition at ABB Components. In projects where it is a problem it seems like it is more related to project maturity than limited personnel. This was based on the fact that conducted projects are often small to medium and when there are problems they are related to resource owners and their decision making about personnel.

• Deficient knowledge transfer
  o Seems to be mostly related to limited resources in the form of both personnel and time. Later phases of projects have less allocated personnel and, therefore, the knowledge transfer task has a low ranking.

• Zero series is limited in the project phase
  o In contrast to our opinion that this problem is mostly related to limited resources in the form of budget and time, is the belief within ABB Components that it has a high relation to all of the four causes.

• Project close-out (Handover)
  o Handover is a problem that in real situations is highly related to limited personnel resources. In later stages of projects when the handover is supposed to take place, there are often critical resources already allocated to different projects, and, therefore, this important part of the project is often performed poorly.
Due to our limited perspective on the occurrence on the identified challenges and their consequences, workshop attendees were asked to appraise the risk of each of the identified challenges. Thereby, a notion could be formed regarding what challenges were most crucial and in need of management.

Table 4 - Risk assessment

<table>
<thead>
<tr>
<th>Problem</th>
<th>Probability</th>
<th>Consequence</th>
<th>Risk level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiation of too many projects</td>
<td>4,2</td>
<td>4,2</td>
<td>17,4</td>
</tr>
<tr>
<td>Different notion regarding feasible criteria for project realization</td>
<td>3,7</td>
<td>3,3</td>
<td>12,2</td>
</tr>
<tr>
<td>Inefficient forming and usage of steering committees</td>
<td>3,2</td>
<td>3,5</td>
<td>11,1</td>
</tr>
<tr>
<td>Too extensive project teams</td>
<td>2,0</td>
<td>2,8</td>
<td>5,7</td>
</tr>
<tr>
<td>Insufficient feedback and documentation</td>
<td>3,8</td>
<td>3,2</td>
<td>12,1</td>
</tr>
<tr>
<td>Inadequate usage of project management models</td>
<td>3,0</td>
<td>4,2</td>
<td>12,5</td>
</tr>
<tr>
<td>Projects accepted with a to-do list</td>
<td>4,5</td>
<td>4,5</td>
<td>20,3</td>
</tr>
<tr>
<td>Resource allocation</td>
<td>3,8</td>
<td>4,2</td>
<td>16,0</td>
</tr>
<tr>
<td>Deficient knowledge transfer</td>
<td>3,7</td>
<td>3,5</td>
<td>12,8</td>
</tr>
<tr>
<td>Zero series is limited in the project phase</td>
<td>3,3</td>
<td>4,7</td>
<td>15,6</td>
</tr>
<tr>
<td>Project close-out (Handover)</td>
<td>3,2</td>
<td>4,3</td>
<td>13,7</td>
</tr>
</tbody>
</table>

Out of the 11 presented problems one was judged below the score of 10. Too extensive project teams. The majority of the attendants meant that this issue was not frequent and the consequence were not something which could have a vital impact on the overall portfolio.

Projects accepted with a to-do list were refereed as the challenges with the highest risk. Respondents meant that this was an issue which was evident throughout every project, and
that the main cause for this occurrence was the reason that resources left the project throughout the closure phase, and project leaders were participating in other projects and shifting focus away from the project. Another corresponding issue which was highlighted was the budget constraints which meant that there was simply not enough funding in order to close a completed project. The consequences of this risk were ranked as very high (four point five), and respondents described this as significant since it could mean that projects are left undone, without gained knowledge and insight being captured.

Initiation of too many projects and resources allocation were the challenges with the second and third highest risk. Respondents confirmed what is perceived as a prominent issue in project portfolio management. However during the workshop it was apparent that this issue was unclear because they were unsure what was considered a project. Throughout the interviews it has been evident that the respondents have a basic common perception of how a project is defined. But the problem is what should be defined by the organization as a formally distinguished project of the portfolio. The consequences were considered high since it resulted in prioritization issues and costs related to allocation of resources in between projects.

When zero series was limited in the project phase respondents explained this as challenging since the consequences were that there could be cross-sectional issues across departments. This issue was expressed for product development where the research department and the production department have a disagreement regarding who is responsible for the closing part of a project. The consequences were described as secondary activates performed by the production line which resulted in overall higher costs.

With the verdict set on risk levels there were discussions regarding what actions should be taken depending on the risk-level. However, the collective opinion was that no risk should be ignored.

- Risk level very low 0 – 5: The issue is considered unlikely to occur and the impact is considered insignificant.
- Risk level low 5 – 10: Indicates that the risk may occur at times and there are minor implications.
- Risk level medium 10 – 15: The risk is sizeable and can be impactful and frequent, and should not be ignored. The average value could concludes that it is noticeable and should therefore be dealt with.
- Risk level high 15 – 20: The issue should be considered significant and actions should be planned to face the risk. It is considered likely to occur.
- Risk level very high 20 – 25: Immediate action should be taken to reduce the impact of risks. The issue will mostly likely occur and the consequences are a direct threat to the project.
Chapter 5

Discussion

In this chapter, thoughts and insights on the findings of the literature review and case study is presented. Furthermore, answers to the research questions are summarized and discussed. This discussion includes comparison on how the findings from previous literature relates to findings from the case study and how the findings may affect the ABB Components. Lastly, a validation and reliability discussion will be presented.

The concise purpose of this study is, as formulated in chapter 1 introduction, to study what types, how, and why challenges related to project portfolio management occur at ABB Components. Based on the purpose and the drive to fulfil it, one main research question was formulated:

What type of challenges are ABB Component facing in their project portfolio management and how should ABB Components cope and its challenges?

Nonetheless, we needed to further define the research question in order to increase the comprehensibility and to determine the direction we wanted our study to progress. This was done by implementing the two subsequent research questions, first presented in chapter 1.5 Research Question. These two questions have functioned as a guideline for this research and will in this chapter be discussed with the target to finally clarify the original research question.

RQ.1 What are the main challenges that ABB Components personnel have faced with project portfolio management and why these challenges affecting project portfolio management?

During interviews a wide variety of problems have been revealed and it was apparent that the diversity of problems were characterized by consequences, frequency, magnitude, and general connection to project portfolio management. A complete summarization in the form of a list of the identified problems is presented in Chapter 4 Case Study. It is our notion that an answer to the first subsequent research question (RQ1) is achievable based on the information gathered from interview data. Interviewees had different roles and relations to project management and opinions about the approach of project management. Despite respondents’ different situations and varied answers regarding criteria of initiation of projects, how projects should be executed and closed-out, we consider it possible to find a representative pattern
which discloses the main problems and how they affect the organization. It is our impression that the identified challenges are not only applicable to ABB Components but with some certainty also applicable to other organizations with a similar project maturity and organizational structure. Research data from authors (Payne, 1995) & (Platje, Seidel, & Wadman, 1994), among others, indicate similar problems, albeit different industries, and not necessarily exclusive for multi-project environments with internal development projects or product development projects.

The main problems identified through the empirical work is established by four main problems; Limited resources (Personnel), Limited Resources (Budget & Time), Vague Directives, and Project Maturity, all in which various way have an impact on the project portfolio, Table 1 on page 56.

**Limited resources (Personnel)** is an issue mostly correlated with resource allocation and too extensive project teams. With regards to limited resource allocation this can conversely affect project prioritization. Scheduling is vital in order to successfully manage projects and to make sure that priorities are set, since challenges in a project can affect the outcome of other projects. Engwall & Jerbrant (2003) argues that resource allocation can cause an adverse outcome in an unanticipated place in the project portfolio. Resource allocation entails distribution of personnel, therefore projects that are delayed can interfere with the planned schedule which ultimately can impact other projects and the overall portfolio.

*If a project team is too extensive* it means that in the initiation phase there is a strong belief that an overqualified team is more suitable for managing a project. The certainty of overqualified teams together with the excessive requirement for finishing projects can results in a competition for resources. The competition is a situation in which project managers together with project owners compete for skilled resources from a limited pool; where the resources are considered right for the project. The end results of a fierce competition has impact on the prioritization of projects since it consequently means that resources are not used as efficiently as possible.

*Over commitment* with regards to a steering committee can be discarded, and rather observed as the inefficient forming and usage of members. The inefficiency is connected to not fulfilling meeting preparations and proper documentation required for decisions making. In deficient situations, members are entangled in discussions regarding technical detail and challenges related to projects. As argued by Elonen & Arto (2003) a reason for the problem of over commitment may be in the fact that roles for project members and steering committee members are somewhat ambiguous. The results of this is a false sense of security in which there is confidence that an overly qualified group is considered appropriate.
Initiation of too many projects is related to a limited budget and unclear directives in terms of criteria for judging if a project is successful or not. The initiation of too many projects with regards to project success theory by Shenhar et al. (2001) means that if the view is employed that focusing on a short-term success dimension covered by project efficiency it can affect the long-term impact of the project. This means that projects are initiated on premises which are not in some cases sufficient for long-term success. Striving to stay ahead in a competitive environment can result in lack of multi-dimensional success if emphasis is solely on project efficiency. Sudden changes in the market and a bold strategy based on meeting shorter product life cycles and reduced time-to-market can spur creativity and initiation of projects. If too many projects are initiated with disregard to other success criteria, projects which may seem feasible according to budget and time may be initiated on incorrect criteria. Thereby creating a situation in which projects are initiated, with good intentions, but with the lack of sufficient resources due to a limited resource pool. Thus ending up with a project portfolio where projects are not manageable due scarce resources. The consequences are as argued by Shenhar et al. (2001) that short-term project success does not necessarily mean that the project is prosperous in the long run.

Limited resources (Budget & Time) is based on activities and discussion during the workshop a cause for problems that is highly related to the final stages of a project. It could be argued that this is in fact quite expected since it is in these stages of a project that the budget and project time frame begins to run out. When the budgeted resources and time are consumed are there some problems that in particular occurs.

Projects that are accepted with a to-do list are so because of several reasons, but on major are the limited time in final stages of projects. Problems that in previous stages of a project have been postponed might require a lot of resources to be solved, possible even more than if they would have been coped with right away when the occurred. Since, resources in these stages often are being assigned to other projects will a limited group of people be forced to solve all problems. With the result being a time-consuming and hard task. If the project is critical to the organization and needs to be finished in time, might further problems either occur when personnel are reallocated and their original duties are altered in prioritization or if the project are finalized with remaining points at the to-do list.

Projects were the zero series is limited in the project phase are a common occurring problem at ABB Components. Since necessary budget and time for projects often are underestimated are the zero series, which is an important part in the final stages, limited or even excluded from the planed project phases. If this is the case may it result in deficits in the product or the production method, which possibly only will be exposed when problems either occurs for a
customer or during production. In these cases the decision to perform a limited zero series will be resulting in delay of product launch, the whole project might be required to be redone and customers that might have received faulty products will have a decrease thrust for ABB.

**Vague Directives** has the highest correlation with problems that on some level are based on individual decisions, such as insufficient feedback and documentation, usage of project management models and knowledge transfer. This is based on the fact that all these problems are related to choices that either project managers or project members’ takes. If directives about roles and/or responsibilities are insufficient this may result in improper decisions.

The insufficient feedback and documentation process has been identified as a problem that occurs because of limited directives, and is in most cases a non-mandatory task. This finding has several similarities to previous studies that state that organizations most often have potential to increase effectivity from a better suited documentation process. The implementation of this process is difficult to achieve. This rests on the fact that all documentation must be performed by individuals that often believe that other tasks are more important, and hence, will prioritize down the documentation and feedback. This is where insufficient feedback and documentation is connected to limited resources in the form of personnel. Since projects in the organization perform concurrently with a limited pool of resources project members are forced to move on to an upcoming project instead of finishing the final parts in the project already started.

**Inadequate usage of project management models** is a problem that mainly occurs in small to medium sized projects, since it is in these projects the project manager chooses what type and what features of project management models that should be implemented. Experience from ABB Components together with results from previous studies proposes that inexperienced project managers often omit important parts of the project management models, since it is in their belief that certain parts will do more harm than good. These part could for instance be feedback, documentation, managerial tasks and final reports. This is a good example of decisions taken on project immature grounds, experienced project managers or project managers with well-formulated and accessible directives would to a higher degree, be able to take the correct decision about what part and features should be included in projects and their management.

**Deficient knowledge transfer** is mainly related to vague directives about what, when, where to and how knowledge is transferred to the organization. However, it is also connected to the insufficient documentation and inadequate usage of PPM. This is because partial documentation limits the chances for project managers in the final stages of a project to have accurate and sufficient information about the project to compile the knowledge and
experience. This where an increased application of PPM would help project teams as well as managers to know what to do and when to do it.

**Project Maturity** as stated in chapter 3.1.3 *project maturity* is defined as either technological or human maturity. In the case of human maturity it is characterized by three subcategories attitude, knowledge and actions. The identified problems are correlated to project maturity because of deficits in one or more of the three subcategories.

Different notions regarding feasible criteria for project realization, is a problem that is related to project maturity since the problem appears when attitudes, knowledge and actions for a project are unsupported and premature. This mainly appeared during interview in the form of unfavorable attitudes towards project risk, knowledge about supposition and actions at a strategic level. In critical project phases a faulty attitude and limited knowledge affect the actions and decisions taken, which instead of resulting in a progressing project may result in a project that is delayed or, even worse, produces a deficient product.

In some situations, inadequate usage of project management models are also related to the managerial level of project maturity. As mentioned earlier, there are insufficient directives for how projects shall be managed. It is likely that this is a result from the level of project maturity. Even though, ABB Components demonstrates a high project success rate and interviews informs about a high level of individual desire to improve there are certain parts of the project maturity features that they need to improve.

**RQ2. What challenges and solutions have been previously identified in studies regarding PPM and the environment that ABB Components currently operates in?**

Problems identified in previous studies that affects project portfolio management have a lot of similarities to the challenges and issues that we have identified at ABB Components. The 11 problems that are presented in *Chapter 4.5 Occurring Problems* are all problems that previously have been acknowledged as factors that in various ways affects the organization’s project management. Our additional work with concluding and arranging the 11 problems into 4 root causes are a stage in the work of finding solutions for the most critical problems.

The researchers, which studies are used in *Chapter 4 Case Study* as comparison between ABB Components and other similar organizations have presented several proposals for methods, work procedures and ways of thinking that may be used to improve project portfolio management. Even though all problems have an individual cause did we find it possible to generate root causes which have a simultaneous effect on several of the problems. These causes may have profound origins in the organization but there are still proposed solutions that may minimize their effect. For instance, developing a wider range of success factors since projects
have different prioritization, opportunities and conditions. Therefore projects also tend to have various factors for success. Another example is continuously improving project maturity. Attitude, knowledge and action are all factors that affect an organization’s project maturity. Therefore, lacking attributes in one factor or several are increasing the risk for problems in a project.

5.1 Criteria for projects

Shenhar et al. (2001) state that management should use a larger perspective on project success and use a multidimensional approach. In their study it is shown that project success dimensions are dependent on what type of project is executed. Furthermore, they present the importance of how success dimensions can vary depending on what type of technological uncertainty the project is defined by. Shenhar et al. (2001) further argues that depending on whether the project is lower-uncertainty it may be perceived that project efficiency is prioritized but argues that those project are on the other hand not targeted at achieving long-term goals such as creating new technology or infrastructure. Thus, this project classification can be used to distinguish between different projects and their strategic goals towards the organizational goals.

On the basis of their research Shenhar et al. (2001) present a framework of usage for organizations:

- Objectives should be specified as early as possible
  - Managers and members of a project team should focus on expected goals
- If the goals is strategic benefits, organizations should include these as measure of determining project success.
- Both short-term and long-term benefits should be judged for the outcome of all dimensions.
- Success dimensions should be weighted differently
  - High-tech projects should be judged by the long-term effects rather than short-term such as meeting budget and time.
  - Low-tech projects should be focused on being completed according to time and budget to make sure that planned profits are gained.
- Management should define success measures before the initiation of a project and devote resources to it.
- Planning for project success should be a part of the organizations strategic management and thinking.
- Project success dimensions should be integrated into the organization’s strategic goals, and included into top-management decision for project initiation.
Managers and project members will be evaluated by performance of all success dimensions, rather than only short-term of meeting time and budget.

- In the execution phase project members will be attuned to pursuing these various dimensions.
- The adjustment will ensure that each specific project is focusing set dimensions: short-run efficiency will be for low uncertainty projects. Long-term goals for projects with high uncertainty, but where overruns may have to be endured to achieve benefits.

The main benefits from this approach are:

- Project classification can show if projects are properly defined or in line with strategic goals of the organization.
- Steering committees and/or the management team can be less hesitant with regards to if the project should be launched or not.
- A comprehension can be formed with regards to what is acceptable in terms of budget override. Project overruns are varying depending on level of technological uncertainty.
  - Low-tech are more likely not be acceptable in terms of overrun due to more standardized products (more impact on project efficiency), while high-tech products are more likely to be accepted (larger impact on customer benefits and preparations for the future)

### 5.1.1 Enlisting projects

There are some projects that are run individually or in smaller teams and considered un-enacted. These unlisted projects of various size and responsibility requirement may have an impact in terms of resources dedicated for projects included in the portfolio (Blichfeldt & Eskerod, 2008). They further mean that it is up to the company to decide whether or not all projects should be included in the PPM and if all projects should be included in a comprehensive project list. If the decision is to not include the set of minor projects in the list, then management levels should assess and decide how much resources should be allocated for a group of smaller projects not included in the project list. Blichfeldt & Eskerod (2008) conclude that in order to reduce the strain on resources dedicated for the enlisted projects is to make sure that smaller projects are not draining critical amounts from official projects. While this methodology can be useful for determining whether or not unlisted projects should be included in the portfolio it can expanded by criteria presented by Shenhar et al. (2001) as well as recommendations by Cooper, Edgett & Kleinschmidt (2000).

The work by Shenhar et al. (2001) can be as stated previously useful for evaluating whether or not these projects are short-term or long-term oriented. While it is highly likely that unlisted projects are short-term oriented, it is arguable that the aggregated impact of several unlisted
projects can have a long-term impact on the portfolio performance, due to the resources required. The recommendations by 
Cooper, Edgett & Kleinschmidt (2000) can thereby be employed to determine whether or not there is a resource capacity available, and if resources can be set free for the unlisted projects. Blichfeldt & Eskerod (2008) states that there is sometimes an indistinguishable thin line between what is considered to be a project accounted in the project portfolio. Thereby, the combination of findings by Shenhar et al. (2001) and by Cooper, Edgett & Kleinschmidt (2000) can be used in coexistence, to determine whether or not enlisted projects are considered successful, according to short-term and long-term criteria. At the same time resource capacity can be assessed to determine whether or not there are available resources.

5.2 Resource allocation and resource planning

Limited resources is conspicuous in terms of making resource allocation and scheduling vital in order to reap the benefits from successful projects. Often organizations resort to short term solutions which is reallocating resources from concurring projects in order to satisfy urgent demands. Yaghootkar & Gil (2011) mean that in if there is no free resource capacity and a reluctance to employ personnel the schedule driven management can be harmful for the organization. The long term effects from schedule driven project management can have a negative impact on the organization’s ability of meeting project milestones. Yaghootkar & Gil (2011) argue that organizations in multi-project settings should put emphasis on ensuring that top management is using a holistic perspective. This to be aware of the importance of discussing project budgets and resource allocation within the planned schedule in order to avoid setbacks for new projects. It is further explained that setting aside free capacity for specialized resources such as investments in product flexibility can be seen as an insurance for future consequences that will pay off when projects unexpectedly suffers from schedule pressure. Lastly it is argued that firms should invest in training and education regarding single-project management and management in multi-project settings.

5.2.1 Resource Capacity Analysis

In addition to utilizing recommendations by Yaghootkar & Gil (2001), an approach to resource analysis is presented with the purpose of analyzing required and available resources for completing projects in the project portfolio (Cooper, Edgett, & Kleinschmidt, 2000). This is a method of analysis used to quantify project demands for resource (person-days of work) in comparison to the available resources. There are two approaches presented for the resource capacity analysis based on the work by Cooper, Edgett & Kleinschmidt (2000).
Do we have enough of the right resources to manage projects currently in the portfolio? To answer this question, there are four main steps described. First, assess how much resources are required to complete the current projects (in portfolio) on time. Second, investigate how much resources are available in the resource pool. Third, compare required resource and available resource, try to identify potential bottlenecks and gaps between resources. Fourth, identify decisive resource constraints such as departments, units, individuals or competences that will be missed first.

Do we have enough resources to achieve new product goals or development goals? There are five key steps for this answer. First, the organization should define new product goals or goals related to internal development. Second, try determining to what amount will these goals contribute to annual sales or what are the gained benefits? Third, assess how much resources will be required to achieve these goals. Fourth, similarly to previous approach identify resources required and available, which will result in a gap between resources. Fifth, make decisions based on whether goals are feasible to achieve or if more resources will be required.

The purpose of this resource capacity analysis is establish some groundwork material as a part of a solution. The main benefits gained are that companies detect that there are too many projects in the portfolio. This usually results in immediate action where renegotiations and prioritization concerns are emerging, as a result of this in most cases 50 percent of the projects are put on hold. Moreover, senior management will rethink strategic goals (it is not unusual with new product goals, that percentage of sales by new products are unfeasible and based on unrealistic criteria). Finally it helps identifying bottlenecks across departments or groups in the innovation process which results in increases, decreases or shifts of personnel. The main conclusion from using this type of analysis is to increase insight of how much resources are used and required for projects in the portfolio. It is not intended as a complete solution to resource prioritization. (Cooper, Edgett, & Kleinschmidt, 2000)

5.3 Improved Information Handling

Feedback and documentation is regarded as an internal and important part of the project life, but has been reported to be insufficient. Documentation throughout the execution phase has been misleading and sometimes not complimentary enough for the decision making process required by the steering committee. The implementation of a clear and structured system for feedback documents such as final reports has been unclear, and the importance of final documentation have been somewhat neglected. Todorovic et al. (2015) suggest a planning
model usable for successful feedback, documentation and knowledge management throughout the projects life cycle. In their model a success analysis framework is included:

- Project planning should include additional terms
  - Critical Success Factors (CSF)
  - Key Performance Indicators (KPI)

Improved information management. This suggestion is aimed at ensuring that criteria for documentation is followed. The purpose is to establish an information management which aims to avoid issues of ‘reinventing the wheel syndrome’, insufficient documentation (not finishing projects on time, or not enough information for decision making), and indecisive decision making. This can be attained by reserving and planning ahead of important activates in the project life. Activities included in this planning and reservation are time set for; planning and preparation of project plans, checkpoints and controls, and making of a final report. Lastly, following a more strict and accurate decision making in scheduled-gate meetings.

Reform knowledge and information of how projects should be carried out. This action should be taken to recognize and give directives of how tools such as PPS should be used depending on the project type and magnitude. In addition this will work towards a general consent of what models and tools to employ. Focus on the organization’s strategic objectives when forming project goals, will aid the resource prioritization process, since the ‘right’ projects can be focused, and the tendency to launch too many projects can be reduced. Secondly, projects should be measured in terms of resource requirement to make sure that personnel have enough time incorporate project work in their daily work schedule.

5.3.1 Project close-out and project handover

It is stated that in the project closure and the handover phase of a project there is a degree of uncertainty regarding when a project is finished or not. This ambiguity causes challenges in particular for product development projects since it causes an unclear agreement between the involved parties. As described further, some of the problems encountered in the closure phase are i.e. reinventing the wheel, modifying products post project closure, not enough time to finish projects. Problems mentioned before are also insufficient feedback and documentation, which are apparent throughout different stages of the project life.

Dvir (2005) argue that the primary actions taken for internal or external contracts should be to allocate resources in advance in order to manage the handover phase. It is further argued that the end user’s effort will have a stronger influence on the project success than activities alone by the developer (Dvir, 2005). The research show that efforts for planning and preparing
termination have an impact on project efficiency, customer benefits, and project success. To realize this, and to facilitate the project closure and handover, an escorting team which represents the customer and engage in the project execution should be assigned. Secondly, a team should be established preparing the handover. The guiding team should include the customer (internal or external) throughout the stages of the project; this will contribute to project efficiency and project success. If issues related to the product can be identified, early modifications can be to fit the customer's needs. Lastly, one should make sure that the developer is supporting the transition of the project to the end-user.

In addition to customer involvement, two additional steps are recommended. Firstly, a plan should be formed and followed in order to properly terminate the project and transfer it to the final user; this may include a complete final report, making sure there is product support, making sure the product is fit for production. Secondly, the plan should be planned, scheduled and budgeted. Thus, it should be considered and treated like other activities part of the project and project plan. These presented solutions are recommended to be as supplementary work for the improved information handling.

5.4 Validation and Reliability

*Internal validity* is a validation method concerned with causality, and it is used to find if a causal relation between two variables is valid. This means that internal validity, questions whether the independent variable is the consequence of variations found in the dependent variable (Bryman & Bell, 2011). Focusing on internal validity in this study is related to causal relationship between challenges identified throughout the project phase and the consequences based on interviews and workshop data. Interviews together with a validation workshop were employed since there were no direct observations regarding what types of challenges are apparent and what their causes are. The workshop was used to validate the research findings from this study with the interviewees. Threats to the internal validity are mainly founded in the human bias. This means that there are threats with whether or not respondents were able to distinguish between whether which issue were rooted in a cause or not. This also implies whether or not respondents could recreate historical events and distinguish between the cause they ought to be the reason for an issue or not. In order to mitigate the risks from these threats the interview respondents were asked follow up questions during interviews in attempts to clarify situations, and several respondents were inquired regarding same uncertainties. In addition, the validation workshop worked towards clarifying uncertainties as to what the causes for challenges were.
Respondent validation aims to reach a congruence between the researches findings and the views and experiences from the interviewees, with the aim of identifying areas with lacking correspondence and main reasons for it (Bryman & Bell, 2011). To reach a level of respondent validation a workshop was held where interview participants were provided with a clear overview of the main challenges and causes. During this session it was clear that respondents were to some degree in agreement with theoretical identifications and findings related to challenges and their causes. There were small differences related mostly to the topic of project maturity, which was in the initial phases of the empirical work not investigated.

External validity. This form of validity questions whether research results found in a research context can be generalized beyond the bounds of the particular context, which means that it deals with whether or not causal relations are unchanged in different settings (Bryman & Bell, 2011). The research is pivoted around a case study which is conducted during a certain time, with a specific organization, and with certain people, therefore it is unlikely that identified challenges, probable causes and possible guidelines and recommendations are applicable in an entirely different context. However, the studied organization is the subunit of a vast organization, operating in a technically advanced field, with personnel such as managers and project managers. Thereby, the identification is in small-to larger organizations in a setting where project managers and managers operate, such as ABB components. There are posing threats to external validity in case studies, meaning that results from single case studies are not generalizable beyond the context. In contrast to this, a case study can aid theories by expanding existing limitations Yin (2009). Identification of solutions and challenges in theoretical work from different context and cases suggest that there are similarities in the case of ABB components, thereby the findings in this thesis can be regarded as affirmative. In attempts to mitigate these risk, the social setting and its actors have been described to the degree of not imposing on anonymity, while still providing a clear overview of the context. Furthermore, theoretical findings have been presented and compared to empirical data to further mitigate the risks.

Reliability is concerned with if the same conclusions and findings could be obtained by another researchers following the same methods employing the same case study (Yin, 2009). Bryman & Bell (2011) mean that this in a threat in qualitative research, and that it is not possible to capture the whole social environment of the study. Thereby not replicable in the same way as quantitative studies. Yin (2009) argue that it is possible to mitigate the risk and increase authenticity by providing a vivid and rich explanation of the methods employed to facilitate the replicability of the study. In attempts to overcome the risk an extensive description have been provided in the Chapter 2 Research methodology.
Chapter 6

Guidelines and recommendations

For the purpose of specifically answering how ABB Components should manage and cope with its challenge, a set of guidelines and recommendations for project owners, steering committees and project managers have been formed. The foundation is based on problems and solutions suggested from theoretical references and requests from respondents during a workshop session. The guidelines and recommendations are not targeted at every identified issue related to the project portfolio, but are formed with the intention of targeting problems of higher priority according to the risk assessment and correlation rating during the workshop. Above all, a general set of recommendations have been formed resolving various challenges.

6.1 General guidelines:

The first solution presented would be information quality. If the information is insufficient the decision making will be lacking behind and become unsatisfactory (Cooper, Edgett, & Kleinschmidt, 2000).

In order to realize this it is recommended to:

- Utilizing the gate model or the newly adopted PPS model to its full potential will make sure that information is of sufficient quality and further facilitate the process of managing information.
  - Follow criteria set for documentation by the requirements of the PPS model.
- Plan ahead and reserve time for important activities, which means plan ahead time for project plan preparations, gate meetings and making of final reports.
- Inform and instruct how individual projects are to be executed, this means defining clear directives for when to use the PPM model. Reform knowledge and information of how project should be carried out. This action should be taken to recognize and give directives of how tools such as PPS should be used depending on the project type and scale. In addition this will work towards a general consent of what models and tools to employ.
- Make sure that the scheduled time for projects is within the scope of employees’ workdays.
- Focus on the organization’s strategic objectives when forming project goals. This will aid the resource prioritization process, since the ‘right’ projects can be focused and the tendency to launch too many projects can be reduced.
- Projects should be measured in terms of resource requirement to make sure that personnel have enough time incorporate project work in their daily work schedule.

### 6.2 Project Initiation

Short term criteria for projects may be satisfactory to pursue and serve as an important factor for staying on the market and remaining competitive. However, there is a problem if too many projects are initiated on the premise of short term criteria and if there is no room left for long-term projects focusing on new products or technical infrastructure. Without a strategy set, tactics will take over and be favorable for smaller short-term projects aimed at quick fixes (Cooper, Edgett, & Kleinschmidt, 2000). On the basis of the research by Shenhar et al. (2001) recommendations for ABB are to implement and define projects according level of technological uncertainty and incorporate different success dimensions. This type of classification can be employed to distinguish between projects and their strategic goals towards the organization, with the purpose of not initiating too many projects based on short term success criteria.

Shenhar et al. (2001) present a framework of usage for organizations and include the following points:

- Objectives should be specified as early as possible
  - Managers and members of a project team should focus on expected goals and management should define success measures before the initiation of a project and devote resources to it.
- If the goals is strategic benefits, the organization should include these as measure of determining project success. Project success dimensions should be integrated into the organization’s strategic goals, and included into top-management decision for project initiation.
- Both short-term and long-term benefits should be judged for the outcome of all dimensions.
- Success dimensions should be weighted differently
  - High-tech projects should be judged by the long-term effects rather than short-term such as meeting budget and time.
  - Low-tech projects should be focused on being completed according to time and budget to make sure that planned profits are gained.
- Planning for project success should be a part of the organizations strategic management and thinking.
- Managers and project members will be evaluated by performance of all success dimensions, rather than only short-term of meeting time and budget.
In the execution phase project members will be attuned to pursuing these various dimensions. The adjustment will ensure that each specific project is focusing set dimensions: short-run efficiency will be for low uncertainty projects. Long-term goals for projects with high uncertainty, but where overruns may have to be endured to achieve benefits.

### 6.2.1 Resource Capacity Analysis

In addition to utilizing existing models for information handling, an approach to resource analysis is presented with the purpose of analyzing required and available resources for completing projects in the project portfolio. This analysis is used to quantify demands in terms of project resources (person-days of work) in comparison to the available resources for projects. There are two approaches presented for the resource capacity analysis based on the work by Cooper, Edgett & Kleinschmidt (2000).

**Do we have enough of the right resources to manage project currently in the portfolio?**

- Assess how much resources are required for the current projects in the portfolio to be completed on time.
- Investigate how much resources are available in the resource pool.
- By comparing required resource and available resource try to identify gaps between resource and potential bottlenecks.
- Identify decisive resource constraints such as departments, units, individuals or competences that will be missed first.

**Do we have enough resources to achieve new product goals or development goals?**

- Define new product goals or goals related to internal development.
- To what amount will these goals contribute to annual sales or the organization?
- Determine how much resources will be required to achieve these goals.
- Similarly to previous approach a gap will be identified based on goals and available resource capacity.
- Make decisions based on whether goals are feasible to achieve or if more resources will be required.

The purpose of this resource capacity analysis is provide some groundwork or material as a part of a solution. The main benefits gained are (Cooper, Edgett, & Kleinschmidt, 2000):

- Companies detect that there are too many projects in the portfolio. This usually results in immediate action where renegotiations and prioritization concerns are emerging, as a result of this in most cases 50 percent of the projects are put on hold.
Senior management will rethink strategic goals (it is not unusual with new product goals, that percentage of sales by new products are unfeasible and based on unrealistic criteria).

Helps identifying bottlenecks in the across departments or groups in the innovation process which results in increases, decreases or shit of personnel.

6.3 **Project closure**

The main concluding remarks from Dvir’s (2005) research, indicate that projects under contract, for internal or external customers should be allocated resources in advance for the hand-over phase of projects, utilizing customer involvement in all stages of the project will most likely contribute to project efficiency and project success.

This can be realized by:

- Assign an escorting team which represents the customer and engage in the project execution. Establish a team that will plan and prepare the handover. Make sure that the developer is supporting the transition of the project to the end-user.
  - Include customer (internal or external) throughout the stages of the project – This will contribute to project efficiency and project success. If issues related to the product can be identified, early modifications can be made to fit the customer’s needs.
- A plan should be formed and followed in order to properly terminate the project and transfer it to the final user – This may include a completed final report, making sure there is product support, and that the product is fit for production.
- The plan should be planned, scheduled and budgeted – It should be considered like other activities in the project life.

For ABB Components actions to realize this can be:

- For product development projects it is recommended to include the customer (a representative of the production department) in the process. This to make sure that there is a lesser gap between the two parties regarding the project feasibility of the project. If the project is an internal development aiming at improving the performance of the production line, an employee or representative of that department should be present.
- Prepare and plan for the zero-series if projects are considered technically complex and make sure that the developer is supporting the transition to the end-user.
- Include the project closure and hand-over phase in the project plan as something that is required in order to fulfill the project goals. A successful project closure and hand-over is part of a successful project.
Chapter 7

Conclusion

The research in this study shows that there are 11 primary problems identified, which appear throughout the three phases of a project; initiation, execution, and closure. The challenges are a consequence of four main factors, limited resource in terms of personnel, limited resources in terms of time and budget, vague directives, and project maturity. This study further attempts to assess the challenges perceived as the most consequently in relation to the causes, and it further attempts to evaluate the correlation between a challenged and a cause. It further shows that the challenges of initiation of too many projects, projects accepted with a to-do list (unfinished) and not including the zero-series are considered the most risky.

Underpinning the guidelines and recommendations for ABB Components is the leg work of previous research, focusing on, criteria for determining project success, methods for handling resources, and the final phase, project termination and project handover. In addition, employee request throughout interviews and workshop have helped navigating towards the most urgent and impactful challenges.

The practical contributions from this research imply that there are several challenges and causes which in various ways have an impact on the project portfolio management in ABB Components. The research highlights the primary occurring challenges and their main causes. Guidelines and recommendations are formed with the intention of facing the challenges and are to be employed as a set of measures towards actions of being conscious of issues in the work environment. The suggestions are targeted at challenges, and the methods and benefits are evident in theory. However in the limitations of the study focus, there are no inclinations as to whether how effective solutions will be, instead solutions are more specified at what end-results can be achieved. Further, solutions presented or identified are to a certain degree applicable to multiple challenges and are not exclusively specific for one type. It is our conclusion that the suggested solutions are applicable to some of the faced challenges at ABB components, and in general to identified challenges applicable not only to the internal multi-project environment.

The theoretical contribution is in line with conforming theories presented, indicating that some generalization can be achieved with challenges related to project portfolio management. The organization studied operates in an internal multi-project environment and it has shown from this research, that identified challenges have similar features to those identified from theoretical work, albeit a different industrial context. The organization, with its portfolio of
different project sizes, and project types such as, product development and internal development projects, has shown that findings are verified in theoretical work, such as, over commitment, project interdependencies, schedule pressure, and project success. In contrast to normative standards; this thesis argues that unclear directives and project maturity is of considerable value with regard to the source of challenges. Initiation of too many projects is considered to be the result of lack of resources. However, this thesis attempts to expand this notion, and argue that the initiation of too many projects can be caused by unclear directives regarding what is considered a project, it is further argues that it is the cause of project maturity. Unfinished projects and the zero-series, are similar challenges, but project specific, with the difference being that there is uncertainties whether or not the zero-series is to be included in the developers project or, if it should be included in the customers project.

It is reasonable that due to the state of the studied organization, project maturity consisting of attitude, knowledge and action, has some imbalance among the individual components. However, it can be questioned whether or not individual components of project maturity have a direct impact towards the three remaining causes for challenges in the project portfolio. For instance, does lack of knowledge about the working procedure result in unclear directives, or does the lack of action at operational level result in unclear directives? Challenges related to the project closure or handover phase are different due to the project goal and customer. Product development projects with the handover to internal customers, appeared to have raised more concerns regarding the specific problem of not utilizing the zero-series, and highlight the need for a more rigid project handover.

7.1 Suggestions for further work

As noted, challenges are based on theoretical work, with different empirical context, thereby it is suggested that future research attempts to further clarify what types of challenges are prominent in different stages throughout the project life, and if there are differences, regarding if the project portfolio consists entirely of product development or internal development. Additional propositions are suggested towards research regarding underlying causes and examining if project maturity is the inception of unclear directives, and whether or not the causes are entirely interdependent of each other. Further, research could seek to verify the correlation between the identified challenges and their main causes, in attempts to decide context specific causes versus general causes.

Additional research could be made in attempts to verify the consequence in quantifiable measures. Such suggestions are for instance, the impact of a budget override (costs) on a
project portfolio, extra time spent on closing projects as compared to the planned realization time. On the foundation of the risk assessment throughout the workshop, suggestions for further work is to verify the limited correlation between the challenges and their causes, as well as, making an attempt to classify challenges and consequence in terms of risk level. In addition, attempts to verify the measures of provided guidelines and recommendations would be proved as expanding, as to whether what types are applicable in general and what types are context specific, or project specific.


# APPENDIX 1 INTERVIEW GUIDE

## INTERVIEW GUIDE

Department: ................................................................. Date: ................... Time: .....................

Name: ........................................................................................................

Phone: ........................................................................................................

Email: .........................................................................................................

### QUESTION ABOUT THE INTERVIEWEES BACKGROUND AND POSITION

What is your position at ABB Components?

For how long have you been working with projects at ABB Components?

Do you have any specific project education/training?

Describe an ordinary day.

What is your definition of a project?

### QUESTION REGARDING PROJECT INITIATION

How do you at ABB Components decide that a project shall be initiated?

Follow-up questions:
- Are pre-studies performed?
- How are project prioritization handled?

How are the steering committee selected?

Follow-up questions:
- What challenges are related to this approach?
- Is it possible to improve this method?

How are the project team selected?

Follow-up questions:
- What challenges are related to this approach?
- Is it possible to improve this method?

How and when are feedback and documentation planned and scheduled?

Follow-up questions:
- Who are in charge for these activities?
- What are the most important parts of feedback and documentation?
- What challenges are related to this approach?
- Is it possible to improve this method?

What types of documentation are required during project planning?
What problems might arise in the project planning phase? Do you feel that these problems are recurring?

Do you have any suggestions for improvement?

QUESTIONS REGARDING PROJECT EXECUTION

Is it your opinion that the project portfolio management models implemented at ABB Components are used sufficiently?

Follow-up questions:
Is there a need to increase the utilization rate and create clearer structure for how to operate these models?
What challenges are related to this approach?
Is it possible to improve this method?
Can you think of a concrete example when the PPS has been beneficial/unfavorable to the project?

What types of documentation are required during project planning?

How are time and resources planned and allocated for projects?

Follow-up questions:
What challenges are related to this approach?
Is it possible to improve this method?

What problems might arise in the project execution phase? Do you feel that these problems are recurring?

Do you have any suggestions for improvement?

QUESTIONS REGARDING PROJECT CLOSURE

How are knowledge transfer handled?

What types of documentation are required during project planning?

What problems might arise in the project closure phase? Do you feel that these problems are recurring?

Do you have any suggestions for improvement?

CONCLUDING QUESTIONS

Can you think of a problem that has occurred or could occur, but that could be avoided if it was managed in project planning? Can you give an example?

Is there anything further you would like to add?

Thanks for your participation!
## APPENDIX 2 WORKSHOP RESULTS

### Theoretical perceived opinion on the relation between problems

<table>
<thead>
<tr>
<th>Problem</th>
<th>Limited resources (Personnel)</th>
<th>Limited resources (Budget &amp; time)</th>
<th>Vague directives</th>
<th>Project maturity</th>
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### Relation between problems and causes based on workshop

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