Learning from previous projects for improving project management practices

Improving project risk management and intra-project communication at Saab Dynamics

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Abstract

Using certain practices for managing projects is a critical factor in successfully executing projects. For a firm where there are few set practices by the organization for managing projects, project managers have to create their own practices with varying degrees of success. Experienced project managers often have had plenty of time to develop fully functioning practices whereas new project managers struggle to find any practice to use. This thesis examines how learning from previous projects at Saab Dynamics can improve the project management practices project risk management and intra-project communication. Further, this thesis proposes how Saab Dynamics can improve continuous risk management and intra-project communication.

A qualitative approach is utilized for this thesis where the data is collected from five separate interviews with project managers from various development projects at Saab Dynamics. The result from the interviews partly contains successful practices used by project managers, such as how to integrate sub-projects or how to manage risks continuously, but also highlights issues for the projects. These findings are analyzed by applying relevant research from the fields of learning in project-based organizations, project risk management and intra-project communication which resulted in a discussion and conclusion providing various recommendations for Saab Dynamics to improve each project management practice.

Key findings include that functions are needed to facilitate learning and how post-project reviews need to be structured to transfer tacit knowledge into explicit knowledge, where focus needs to be on documenting using stories. Further, this thesis utilizes a model for risk maturity with five steps where only the top two allow for continuous risk management. To progress to these steps the importance of building a risk culture is recognized where the issue is in communicating the set process of risk management to project managers. Here, having a risk manager is identified as important. Intra-project communication focuses on the areas of information distribution, sub-project integration and communication planning. It was found that the information distribution needs to be balanced between forced and voluntary communication. Moreover, five mechanisms for integration are covered where some are more important for complex projects and some during high uncertainty. Lastly, a model for a communication plan is presented.
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1 Introduction

This chapter will present the theoretical and practical relevance of the problem in the form of a background. Subsequently, the problem is funneled down into a purpose with two research questions and delimitations.

1.1 Background

Project management is a vital component in today’s organizations, especially when it comes to complex products and systems (CoPS) (Hobday, 2000; Söderlund, 2002; Lee & Yoon, 2015). CoPS are defined as high technology goods where individual products are constructed using a large number of components and where the product value is immense (Hobday, 2000; Lee & Yoon, 2015). Projects for CoPS often demand a large number of workers and a specific team is responsible for a distinct component (Sosa, Eppinger & Rowles, 2004). The development of these complex products demands a mixture of diverse knowledge and experience which makes the project a highly suitable form of organization for this purpose, without the project it would be almost an impossible task to combine and communicate resources (Hobday, 2000).

One particular component which is highly important to the progression and outcome of the project is the inception (Crosby, 2017; Smith, Wyatt & Love, 2008). Doskočil (2016) found risk management and communication to be two components of project planning which tend to cause project failure when managed poorly. Risk management is widely considered a key factor to project success (Ryu, Lim & Suh, 2016; Kafol, 2016) and using certain tools or defined processes for managing risks allows managers to acquire critical information regarding the risks which can ultimately enhance the outcome of the project (Kafol, 2016). Even though risk management is often associated with the declaration of risks, it is important to continuously manage risks throughout the project (Cagliano, Grimaldi & Rafele, 2015). Similarly to risk management, communication is also found to be a critical factor for project success (Söderlund, 2011; Molena & Rovai, 2016). Even though most project managers are aware of the significance of communication, it is often overlooked or even taken for granted (Samáková et al., 2017). Hence, a clearly defined plan for what communication tools to use and how and when to use them is necessary for project success (Samáková et al., 2017). Communication when structured well can reduce or even eliminate risks for delays, duplicate work and misunderstandings (Mikhieieva & Waidmann, 2017).

Cooper, Edgett & Kleinschmidt (2004) classify the beginning of a project as one of the most problematic phases and thus it requires particular consideration. More specifically, processes and management activities have been found as major predicaments for new product development projects (Salomo, Weise & Gemünden, 2007) and as there are little help for newly appointed project managers to choose between the plethora of models, they are left with their own limited experience and knowledge (Buijs, 2008). Risk management is one example of what a project manager is expected to implement during the planning phase and where there are numerous alternative methods or models (Arrow, 2008; Cagliano, Grimaldi & Rafele, 2015). Further, Arrow (2008) recognizes how risk assessment and risk analysis, which are most commonly assumed to be equivalent with risk management, merely are components of a good functioning risk management. Cagliano, Grimaldi & Rafele (2015) discuss the concept of risk maturity, where risk assessment is carried out by most firms but only the most mature firms practice risk monitoring and control. Kafol (2016) highlights the importance of considering all phases of risk management in order for the project manager and organization to attain as much knowledge as possible regarding the risk scene. Identification of tools and
methods for communication is another task which is central for project managers to be able to do (Samáková et al., 2017). For a project to be able to succeed, information needs to be distributed across the entire project team in an effective manner, which is the responsibility of the project manager (Zhang, Basadur & Schmidt, 2014). Moreover, Sosa, Eppinger & Rowles (2004) present how different interfaces for complex product components need to be managed with interactions between the teams responsible. Even though each component often is its own project or sub-project, they will have to be integrated at some point and this is a challenge for most complex projects (Crosby, 2017).

At Saab Dynamics a survey was sent out to project managers in an attempt for the project management office to gain an understanding of what challenges a project manager finds most difficult. The results of this survey pointed to challenges in project inception, more specifically project managers found that there is little help in terms of guidelines and recommendations for how to work with certain practices within project management. It was found in the problem research for this thesis that improving organizational learning can help in establishing guidelines for other projects to follow. The problem research further found two problem areas within project management, namely risk management and intra-project communication. Firstly, the project management office has been attending to project risk management recently by identifying and communicating it as a highly important process, but project managers still struggle to effectively carry out the risk management process. Here, risks can be identified and analyzed properly, but the aspect of continuously managing risks is missing. Secondly, the ability to distribute information in projects along with communication and alignment between sub-projects of larger complex projects was found to be another problem. The problem research for this thesis recognized that these two practices could also be improved by applying individual learnings from previous projects.

1.2 Purpose and research questions

The purpose of this thesis is to examine and propose how learning from previous projects can improve project management practices. Two project management practices have been selected as the research base for this thesis: project risk management and intra-project communication. This purpose is broken down into two research questions declared below.

RQ1: How can continuous risk management in development projects at Saab Dynamics be improved by applying learnings from previous projects?

RQ2: How can intra-project communication in development projects at Saab Dynamics be improved by applying learnings from previous projects?

1.3 Delimitations

This thesis will utilize a twofold definition of learning. First, organizational learning will be viewed from a theoretical and empirical perspective to examine and propose how inter-project learning can improve project management practices. Second, individual learnings regarding project risk management and intra-project communication from project managers will be used as empirical data to be able to answer the research questions, thus individual learning is not directly viewed from a theoretical perspective. Further, continuous risk management is in this thesis regarded as risk management where focus is to keep risk analyses updated with continuous assessments of the risk landscape. Intra-project communication will concern how communication is carried out within a project. This thesis is not specifically about CoPS, although the CoPS field of research contains some highly relevant applications, which is why CoPS will be mentioned at suitable points throughout the thesis.
2 Theoretical framework

In this chapter, theoretical concepts and models are presented. These theories aim to strengthen the knowledge base in the problem areas. The first section will cover various processes in project management with a focus on learning which is in line with the purpose of this thesis. This section is followed by one respective section for project risk management and intra-project communication. In the end, the analytical model presents how these theories are related.

2.1 Project management

This section will provide some basic knowledge regarding project management including various processes used by firms. Continuing, the focus will be on learning in project-based organizations.

2.1.1 The project management process

A project is defined as a temporary endeavor used to create a unique product, service or result (PMI, 2008). Project management itself is thus the application of knowledge, tools and skills to actively reach the project goal (PMI, 2008). One popular process used by firms to carry out projects is the waterfall model where Stage-Gate is one example of such a model (Cooper, 2008). The Stage-Gate process consists of five stages including (1) scoping, (2) build business case, (3) development, (4) testing and verification and (5) product launch (Cooper, 2008). Waterfall models used in projects tend to have decision points between each phase and in the case of Stage-Gate there is a gate in between every stage where the progress is to be assessed and eventually lead to a decision to continue to the next stage or to terminate the project (Cooper, 2008). Another model used for product development projects is the new product development (NPD) process which includes the phases of planning or pre-development, execution or development and commercialization (Reid & Brady, 2012). These two models can be used for product development regardless if it is performed in a project or not (Cooper, 2008; Reid & Brady, 2012) but the project itself according to PMI (2008) is supposed to contain five phases. First is the phase conception and initiation where the project is formally initiated (PMI, 2008). Second is the definition and planning phase where tasks such as budgeting, time planning, risk management and communication planning are included (PMI, 2008). This phase is essential since it contains procedures which act as building blocks for the entire project execution (Cooper, Edgett & Kleinschmidt, 2004). This is where many firms find problems causing project failure (Cooper, Edgett & Kleinschmidt, 2004) which makes this phase well suited for learning (Stockstrom & Herstatt, 2008), thus learning in project-based organizations will be covered in more depth below. The third phase is the execution phase where focus is on progressing through the project plan, completing tasks, and communicating progress (PMI, 2008). Fourth is the monitoring phase which occurs simultaneously as the execution phase, although the focus is on measuring performance in different ways (PMI, 2008). Lastly, phase number five is project closure where various reports are written and the project is closed (PMI, 2008).

2.1.2 Learning in project-based organizations

For most organizations, many projects fail on a yearly basis and thus a lot of effort is put into analyzing what the problem is (Crosby, 2017). Failure is a sound opportunity for learning and project failure is an opportunity for inter-project learning, but despite this most firms seem to be failing to learn between projects (Crosby, 2017). Competition is more profound for every
day and to keep the competitive edge in product development it is essential for an organization to learn from project to project (Goffin & Koners, 2011).

Stockstrom & Herstatt (2008) describe how the planning phase for many firms is an area for major improvements and yet a study by Goffin & Koners (2011) found that project members’ lessons after projects are mainly focused around project planning activities such as resource planning, budgeting and time management. Even though there is a significant amount of knowledge creation in new product development and numerous individual lessons learned from project to project, little knowledge is actually transferred by the project team (Goffin & Koners, 2011). One reason for this is budgeting, most firms are unable or unwilling to spend time post-project to reflect on progress, strengths and weaknesses and thus there is no structured method for learning in place (Crosby, 2017). Hobday (2000) describe six distinct organizational forms, each with a different balance between projects and functions. These are functional organization, functional matrix, balanced matrix, project matrix, project-led organization and project-based organization (Hobday, 2000) and are illustrated in Figure 1. SM stands for senior management, F for function and P for project, various functions can be procurement, manufacturing and research and development (Hobday, 2000).

Figure 1: Organization forms (Hobday, 2000, p. 877).

Functional organizations do not have any projects, whereas functional matrixes have projects with weak coordination (Hobday, 2000). A balanced matrix has a slightly stronger project authority compared to the functional matrix and project matrixes have equal status between functions and projects (Hobday, 2000). Project-led organizations still have functions, although weak compared to the project and lastly the project-based organization does not have any functions at all (Hobday, 2000). Hobday (2000) found organizations with stronger functions to successfully learn between projects, whereas those organizations with weak or non-existent functions struggle with learning. Mechanisms and structures for learning, such as post-project reviews, are often associated with certain functions which can explain why learning is a weakness for project-based organizations (Hobday, 2000). To allow for project-based organizations to perform function-specific activities such as learning, Hobday (2000) suggests taking a step back in the organization form to strengthen the functions.
One place in projects specifically suitable for learning is the initial phases, for example project planning (Smith & Winter, 2010). When starting a new project, exploring and sharing past experiences is an excellent way for the project to learn from previous projects (Smith & Winter, 2010). Goffin & Koners (2011) have found post-project reviews to be the best tool for inter-project learning, deep and semi structured discussions are good for stimulating both individual and team learning, but it is essential for the discussions to be thoroughly documented in order for the knowledge to be stored (Goffin & Koners, 2011). Goffin & Koners (2011) further elaborate on how post-project reviews result in tacit knowledge being shared by the use of metaphors and stories since these concepts have been found to trigger knowledge creation. Stein & Vandenbosch (1996) conversely discuss how the concept of learning during a project is superior to learning in between projects since the current project can be improved and not just upcoming projects.

Nonaka (1994) describes two dimensions of knowledge essential for learning: tacit knowledge is personalized, informal and often abstract and is generally difficult to share, whereas explicit knowledge is formal and systematic and can easily be stored in a database for example. The knowledge creation model by Nonaka (1994) is a well-known theory for learning and how different kinds of knowledge is transferred. There are four proposed modes of knowledge creation including socialization, externalization, internalization and combination (Nonaka, 1994). Socialization transfers tacit knowledge from one person to another through shared experiences, this cannot be done without a component of observation and imitation (Nonaka, 1994). Externalization takes tacit knowledge and makes it explicit by the use of metaphors and concepts which enables the knowledge to be effectively shared (Nonaka, 1994). Sakellariou, Karantinou & Goffin (2017) found metaphors to naturally emerge from the use of stories during a post-project review. The stories triggering the most knowledge creation are told by technically experienced project members with a skill for narration and the stories are about experiences from the project (Sakellariou, Karantinou & Goffin, 2017). Continuing, internalization converts explicit knowledge into tacit and this is what is assumed to be the standard concept of learning, to use action to learn (Nonaka, 1994). Lastly, combination is a mode which converts a person’s explicit knowledge to another person’s explicit knowledge, this is accomplished through meetings and conversation (Nonaka, 1994).
2.2 Project risk management

The problem research for this thesis showed an inability for projects to manage risks continuously throughout the project, which refers to monitoring and controlling of risks. Hence, this section will include literature on the risk management process with the monitoring phase covered more deeply, but before that a model for risk maturity will be presented which affects whether or not an organization is capable of continuously monitoring risks. One especially critical component of risk maturity is risk culture which will also be covered.

2.2.1 The risk management process

Firmenich (2017) suggests a model for project risk management consisting of various phases which have been summarized into Figure 2 below. (1) Risk identification refers to the process of identifying the various risks along with causes, (2) risk assessment establishes probabilities of occurrence and possible impacts, (3) risk classification prioritizes the various risks and (4) risk mitigation develops actions for when risks do happen (Firmenich, 2017; Kafol, 2016). The final step is (5) risk controlling/monitoring which refers to the continuous risk management process of managing new risks and tracking and responding to risks (Cagliano, Grimaldi & Rafele, 2015; Firmenich, 2017). Arrow (2008) identifies risk monitoring as the most difficult phase for firms to manage as projects need to continuously redo the risk management process and not merely do it once and let it go. Cagliano, Grimaldi & Rafele (2015) further identify risk monitoring as a task only firms and projects who are able to achieve a certain level of risk maturity can manage, hence the concept of risk maturity will be covered next to shed light on how effective risk monitoring can be achieved.

![Figure 2: The five phases of risk management, inspired by Firmenich (2017).](image)

2.2.2 Risk maturity

A concept for risk maturity is proposed by Cagliano, Grimaldi & Rafele (2015) where it is suggested that a firm’s ability to manage project risks is dependent on what level of risk maturity the project and organization has. The risk maturity is affected by organizational culture with its attitude towards risk as well as size and type of the organization along with the information context (Cagliano, Grimaldi & Rafele, 2015). Four stages of risk maturity according to a model by Hillson (1997) are naïve, novice, normalized and natural; (1) naïve are those firms who do not practice risk management, (2) novice refers to organizations aware of the need for risk management but do not have a clear structure for managing risks, (3) normalized are firms who have implemented formalities for managing risks but do not manage to carry them out in every project, and lastly (4) natural are firms who are consistently managing risks according to a defined process. Risk maturity is related to the phases of risk management in Figure 2 according to a theory by Cagliano, Grimaldi & Rafele (2015). For novice firms, there is usually no risk analysis, risk mitigation or risk controlling, whereas normalized firms tend to perform better in risk analysis and sometimes even in risk mitigation (Cagliano, Grimaldi & Rafele, 2015). In order for an organization to fully master the controlling and monitoring of risks, it needs to be of natural maturity (Cagliano, Grimaldi & Rafele, 2015).
Yeo & Ren (2009) propose a similar model to the one by Hillson (1997), although their model is designed specifically for CoPS and in their model there are five levels of maturity including ad hoc, initial, defined, managed and optimizing. (1) Ad hoc are those organizations thinking no structured approach to risk management is needed, no effort is put into identifying project risks or trying to mitigate them (Yeo & Ren, 2009). This approach is generally volatile as all actions are reactive and unanticipated events tend to cause trouble, although CoPS in particular are rarely associated with such a flawed risk management process (Yeo & Ren, 2009). Further, Yeo & Ren (2009) define the (2) initial phase as where the need for project risk management is recognized, but no effort is put into establishing an organization-wide risk management process. A (3) defined risk maturity is where projects do implement a formal risk management system, risks are measured using probability, impact and severity and the organization is providing training and education to strengthen the overall knowledge and awareness of risks (Yeo & Ren, 2009). This is a likely scenario for organizations formed as a matrix with focus on projects (Yeo & Ren, 2009). These three phases correspond well to the model proposed by Hilsson (1997) with the phases of naïve, novice and normalized. The fourth phase, which is also the last phase, is natural and refers to firms constantly reaping the benefits of close-to-perfect risk management processes in every project (Hilsson, 1997). The (4) fourth phase definition by Yeo & Ren (2009) is more elaborate, every aspect of the risks is measured and analyzed, both internal and external stakeholders are directly involved in the risk management process and a culture of risk awareness is established in the organization. This includes monitoring of the risks by evaluating and assessing risk mitigations and analyses. Even though Hillson (1997) sees this phase as fully mature, Yeo & Ren (2009) take it one step further in the phase of (5) optimizing. Here, project members and staff utilize various networks internally and externally to achieve innovation and thus evolve the risk management process and project performance (Yeo & Ren, 2009). Since both models for risk maturity described here are similar, a composed model is created according to Figure 3.

Figure 3: The five phases of risk maturity, interpreted from Yeo & Ren (2009) and Hillson (1997).

For an organization to take steps up the maturity ladder exhibited in Figure 3, it takes consistent focus on developing the risk management process (Cagliano, Grimaldi & Rafele, 2015). Yeo & Ren (2009) identify 10 areas of capability divided into the categories organization, process and technology. For organization the areas are centered around culture, leadership and stakeholders, the process category mainly consists of the different stages in risk management and technology regards to knowledge about the technology being developed (Yeo & Ren, 2009). It is important to equally focus on all these key areas in order for the organization and project to mature in risk management (Yeo & Ren, 2009). Continuing, a firm will have to focus on assessments of its risk activities for them to improve and for a culture to develop which induces risk awareness behavior since it is of high importance that there is an established risk culture (Cagliano, Grimaldi & Rafele, 2015). Yeo & Ren (2009) along with Cagliano, Grimaldi & Rafele (2015) found risk culture to be one of the most vital factors for progressing in risk culture, especially for firms seeking to reach a risk maturity which strengthens the ability to act on unforeseeable events, thus the concept of risk culture will be
explored in more detail below. A set of activities is proposed by Yeo & Ren (2009) to help organizations progress in maturity, as presented in Figure 4.

Figure 4: Activities for progressing in risk maturity, inspired by Yeo & Ren (2009).

To progress from phase 1 of risk maturity according to Hillson (1997), a firm needs to appoint a few employees and educate them in risk management to act as ambassadors and ensure top management support. For the firm to progress to phase 3 there is a need for a larger allocation of resources for risk management, making the process routine and also to view successful examples of projects successfully implementing and reaping the benefits or risk management (Hillson, 1997). The fourth phase, which is the last one according to Hillson (1997), is hard to reach but can be achieved through learning and ensuring risk is part of every thought and decision (Hillson, 1997).

2.2.3 Risk culture

A firm’s risk culture can be defined as the overall attitude towards risk, most importantly among top management (Pan, Siegel & Wang, 2017). The risk culture is often set in place by company founders and usually changes minimally throughout the years, this is due to managers’ abilities to select and recruit successors with similar beliefs, values and thus a similar approach to risk (Pan, Siegel & Wang, 2017). Roeschmann (2014) describes how the actual culture is determining all risk actions performed, even though a formal risk management process is stating something else. For an organization to be able to have a fully functioning risk management process, a risk culture needs to support it (Roeschmann, 2014) and building a risk culture is something only top management can do (Yeo & Ren, 2009). One way top management can strengthen the risk culture is through communicating the importance of risk management and conveying that risk management is to be prioritized (Roeschmann, 2014). Roeschmann (2014) further elaborates on risk culture and how it can also be achieved through learning, by experiencing what is or is not working and what is rewarded by management.

Risk culture depends on three factors, namely artifacts, espoused values and basic assumptions (Roeschmann, 2014). Firstly, everything comes back to what formal processes are set by management, namely artifacts, since employees are urged to use these processes or systems (Roeschmann, 2014). Secondly, although these artifacts are set, there can still be some confusion on how to practically perform these processes, thus it is common for firms to
issue statements or philosophies which communicate the essence of the artifacts, which are the espoused values (Roeschmann, 2014). Thirdly, perhaps the most important factor is basic assumptions, which is what people and groups have learned to be effective and the optimal way to solve problems (Roeschmann, 2014). Roeschmann (2014) means that the set process for risk management (artifacts) affects the communicated approach (espoused values), which in hand affects the individually perceived approach to managing risks (basic assumptions). Similarly, Bozeman & Kingsley (1998) propose a set of variables affecting organizational risk culture. Bozeman & Kingsley (1998) found perceived trust from top management to be the most positively affecting factor for risk culture along with having a mission which is clear to all employees, whereas procedures and rules which impede effectiveness are found to negatively affect risk culture.

Figure 5: The process creating the risk culture, inspired by Roeschmann (2014).

There is a dynamic flow between the factors of artifacts, espoused values and basic assumptions creating the risk culture which is illustrated in Figure 5, but the most interesting connection is the contrast between espoused values and basic assumptions (Roeschmann, 2014). This connection delineates the conflict between what top management wants to communicate and what employees perceive to be the correct approach to manage risks (Roeschmann, 2014). Roeschmann (2014) depicts how people find it irrational to execute a task differently to the approach they find optimal, hence the person executing the task needs to consider the espoused values effective, otherwise the approach in which the task is executed is not likely to be changed. One approach to troubleshoot the risk culture and possibly enhance it is to start looking at the basic assumptions among the project members and contrast them with the artifacts (Roeschmann, 2014). If the difference is substantial, the espoused values will most likely have to be improved (Roeschmann, 2014). This can be done by appointing a risk manager who can educate projects in how the risk management process is supposed to look (Yeo & Ren, 2009) or through clarified and specific processes (Roeschmann, 2014). Yeo & Ren (2009) emphasize that the risk manager needs to be completely aware of the process which top management has set for risk management in order for the risk manager to be able to educate projects properly.

2.2.4 Risk monitoring

As Cagliano, Grimaldi & Rafele (2015) state, the phase of risk management which requires the highest level of maturity is risk monitoring and controlling, which is the last phase in Figure 2 and requires the risk maturity of phase 4 in Figure 3. Muriana & Vizzini (2017) have found that risk monitoring is one factor which many firms struggle to carry out in an effective approach. Kaliprasad (2006) explains how firms most often overlook this phase of risk management simply because they believe their risk action lists will save them forever, although in reality the risk landscape changes and thus affects the work done in risk analysis. Moreover, Kaliprasad (2006) proposes three specific areas for risk monitoring: expected losses, review prevented risks and review mitigated impacts for occurred risks. First, monitoring the expected losses can demonstrate the effectiveness of the risk action plan since the expected losses should decrease in time if the action plan is effectively working (Kaliprasad, 2006). Second, the process of reviewing those risks which have been
successfully prevented will tell if the prevention plan is effective (Kaliprasad, 2006). Lastly, Kaliprasad (2006) recommends firms to continuously review mitigated impacts, for risks which have in fact occurred. This can give an indication to how well the risk mitigation plan is working (Kaliprasad, 2006). This reviewing process is a good way for organizations and projects to learn and improve the risk management process as the project progresses, instead of relying on what was said and done during the planning phase (Kaliprasad, 2006).

Zou, Wang & Fang (2008) propose another model for the risk monitoring process where it is recommended to continuously throughout the project check for changes in the risk landscape. One change can be if any identified risks have altered in terms of probability or severity and if that is the case then the appropriate risk plan needs to be updated accordingly (Zou, Wang & Fang, 2008). Another change is whether new risks have surfaced which should now be analyzed according to the set process for risk analysis (Zou, Wang & Fang, 2008). Zou, Wang & Fang (2008) also discuss the importance of utilizing knowledgeable project members to identify risks as they often have plenty of experience with the concerned technology. Further, projects need to regularly rework almost the same process which was carried out during risk identification, risk assessment and risk classification; this will keep the risk management process active and thus avoid risks affecting projects in an unexpected manner (Arrow, 2008).
2.3 Intra-project communication

In the following section, the topic of intra-project communication will be covered. The problem research for this thesis found obstacles in information distribution, which is to say how the project manager distributes information to the project members, and sub-project integration, which is how communication is carried out between sub-projects. Literature on these areas will be presented along with one section presenting the importance of communication planning. Although first, some introductory research on communication will be covered.

Communication, which is defined as sharing relevant knowledge between project members, needs to occur in projects in order for the project to be able to succeed (Ceric, 2014). Ziek & Anderson (2015) discuss a twofold definition of communication; first, it is an essential skill for any project manager to have and second, it is a critical factor affecting project success and failure. Shannon & Weaver (1949) propose a model for communication consisting of one information source with a transmitter and one destination with a receiver where the message is encoded by the transmitter and decoded by the receiver. The difference between the transmitted message and the received message is called noise and more noise in communication will lead to more misunderstandings (Shannon & Weaver, 1949).

There are many available tools for facilitating communication in projects, among them are face-to-face conversations, dashboards, phone calls, e-mails and collaborative design systems, and the general consensus among scholars is more communication equals a higher chance of project success (Ziek & Anderson, 2015). Samáková et al. (2017) distinguish between synchronous and asynchronous communication and synchronous communication is further divided into straight and virtual, which is illustrated in Figure 6. Synchronous communication provides an opportunity for alternating communication direction, whereas asynchronous communication merely offers communication in one direction (Samáková et al., 2017). Straight synchronous communication means there is little or no delay in response time and conversely virtual synchronous communication comes with some amount of delay (Samáková et al., 2017).

![Figure 6: Tools for communication categorized, inspired by Samáková et al. (2017).](image)

2.3.1 Information distribution

Zhang, Basadur & Schmidt (2014) found in their study that project teams where the information is unevenly distributed make poor decisions. The project team tends to only utilize common information and hold back individual knowledge which further contributes to an uneven information distribution in development projects (Zhang, Basadur & Schmidt, 2014). During projects extensive information needs to be managed, although all information is not important or even necessary all the time, thus it is recommended to merely focus on one fragment of the information at any given point (Pucihar et al., 2016). Meetings are identified as one of the most effective means for communicating information to reach all project members, although for the meeting to be effective the right persons need to be part of the
meeting, meaning that the purpose of the meeting needs to be represented by appropriate knowledge (Yap, Abdul-Rahman & Chen, 2017). However, meetings are considered as a forced method for communication, meaning the information is forced onto the recipients whether they want it or not, and some people respond negatively to forced communication and find it hard to ingest the information (Nielsen, 2009). Conversely, e-mails and webpages are considered voluntary information and can thus suit some people better, even though both methods have their respective positives and negatives (Nielsen, 2009). Nielsen (2009) further elaborates that for most projects a combination of forced and voluntary information is recommended since this will lead to more people being able to absorb the information. During normal conditions, while no particular problem is currently visible, status meetings are recommended to once per week and during troubled times more frequent meetings might be required, although careful consideration is required regarding an increased meeting frequency since the project cost will rise considerably (Nielsen, 2009).

Another effective approach of distributing information is the use of a progress dashboard (Meyer, 1994; Nielsen, 2009). The dashboard, consisting of several gauges on progress, can include measures such as time plan and upcoming milestones, economics such as budget and profits and a graph displaying staffing over time (Meyer, 1994). The most important factor in successfully capitalizing from a dashboard is to include metrics important to the project in question, metrics considered critical for the success of this project (Meyer, 1994). Kawamoto & Mathers (2007) consider the evolvement of the dashboard to be crucial to long-term success, the board needs to evolve to match the newest conditions, and this is also identified as a common problem in organizations. Meyer (1994) emphasizes one of the key purposes of having a project dashboard is for the project team, and other stakeholders, to easily be able to gain an understanding of the progression, obstacles and prioritizations.

2.3.2 Sub-project integration

Large complex development projects are commonly divided in several sub-projects, often one sub-project is responsible for one component and in the end all components will be assembled into the final product (Sosa, Eppinger & Rowles, 2004). Sosa, Eppinger & Rowles (2004) explain the concept of interfaces, where two components are supposed to interact with each other and thus depend on each other’s architecture. Two interfaces will need a pathway for communication between those sub-projects responsible for the concerned components in order for the components to develop compatibility (Sosa, Eppinger & Rowles, 2004). Zhang, Basadur & Schmidt (2014) reinforce how managers and project managers are responsible for creating processes and structures which will provide communication pathways between project members, which will support interaction and integration. One method for communication can be a shared document between two interfaces, stating requirements where both project teams continuously update the document with their solutions, which can result in better alignment between the concerned components (Sosa, Eppinger & Rowles, 2004). Dietrich (2006) observed 15 mechanisms for project integration arranged in five categories, as illustrated in Figure 7 below. During normal conditions, projects should rely on various mechanisms for integration, focusing on just a few can have a negative impact on project outcome (Dietrich, 2006). Although, under high uncertainty situations, informal group integration and formal personal integration are found to be more important as formal impersonal integration and informal personal integration become less important (Dietrich, 2006). Further, for complex projects, decision-making committees, reporting and formal documents are found to be more prioritized and informal personal integration less prioritized and for a combination of highly innovative and highly interdependent projects, the importance of formal and informal group mechanisms are vastly increased (Dietrich, 2006).
Scholars generally recommend development project teams to be co-located, but Lakemond & Berggren (2006) suggest them to be co-located in early and final stages, although not necessarily in between those phases. The initial stages of product development often require idea generation, decision-making and relationship building and towards the end there is an increased amount of problems which need to be managed with integration, thus these stages benefit from co-location (Lakemond & Berggren, 2006). Mid stages of the development projects can benefit from expertise which often is found in home departments, away from the project team (Lakemond & Berggren, 2006). Conversely, McDonough III, Kahn & Barczak (2001) propose that co-locating product development projects eliminates various challenges and allows for improved communication.

Sosa, Eppinger & Rowles (2004) suggest documenting the product architecture and analyzing it for potential interfaces which will require interactions with each other. From this, managers can predict desired project team interactions allowing for minimal trouble in component integration (Sosa, Eppinger & Rowles, 2004). Especially for products utilizing the architecture from previous generations, learning can lead to better alignment between interfaces and team interactions and thus avoiding similar mistakes in the future (Sosa, Eppinger & Rowles, 2004). If learning in this area can be achieved, it could be a major benefit for future projects and not only for similar architectures, but for new products since managers can predict project team interactions based on potential component interfaces (Sosa, Eppinger & Rowles, 2004).

2.3.3 Communication planning

For large, complex projects, having every aspect of communication written down in a communication plan can be beneficial in radiating trust and commitment to stakeholders (Butt, Naaranoja & Savolainen, 2016). Being able as a project manager to utilize situation- and stakeholder-appropriate communication can mean the difference between a failed or shutdown project and a succeeded project (FitzPatrick, 1997). Nielsen (2009) considers communication to actually be a deliverable in a project, or at least considered as one. Communication is something every stakeholder assumes is managed satisfactorily by the project manager and thus it is important to plan ahead for it (Nielsen, 2009). The communication needs to be accurate and honest, which can further accentuate trust and help establishing a good relationship with key stakeholders (Nielsen, 2009).

Samáková et al. (2017) argue for project planning to include a communication plan including communication environment, communication channel, communication cognitive and communication system. The communication environment will facilitate for effective communication to be possible by stating a strategy for communication and the organizational
structure; communication channel involves methods, tools, frequency and support for communication; communication cognitive manages human factors such as cultural differences and skills; and communication system includes systems for feedback and information sharing and distribution (Samáková et al., 2017). Samáková et al. (2017) propose three distinct identifications needed to be done during the planning phase, these are stakeholder identification, identification of methods, tools and support communication and content identification. First, the project manager will have to identify which stakeholders the project will have to communicate with, such as project members or other internal or external parties (Samáková et al., 2017; Nielsen, 2009). Next, the project manager will have to identify what methods and tools to use for communication with the various stakeholders, including straight synchronous, virtual synchronous and asynchronous communication (Samáková et al., 2017; Nielsen, 2009). Lastly, it is required to identify what will have to be communicated (Samáková et al., 2017; Nielsen, 2009).
2.4 Analytical model

This section will present how the concepts and models in the theoretical framework relate to each other to achieve the purpose of this thesis.

The theoretical framework presented above is intended to increase the knowledge base of the problem area and assist in the analysis and interpretation of the empirical evidence to satisfy the purpose of this thesis. First, the section Project management presents some basic research regarding the project management process and specifically for learning in project-based organizations, which is supposed to demonstrate how knowledge is transferred between projects and thus how learning can improve project management practices which is the purpose of this thesis. The concept of learning from previous projects is then applied to project risk management and intra-project communication in the form of accumulated individual learnings in the analysis. Second, the section Project risk management is intended to present research on how a firm can achieve effective risk monitoring throughout the project, which is considered as continuous risk management and is essential to RQ1. Risk maturity is identified as a determining factor for how a firm or project can monitor risks and further risk culture is identified as one of the major components affecting risk maturity, thus these concepts are considered to affect each other according to Figure 8. Third, the section Intra-project communication exhibits how information distribution and sub-project integration, which were both found to be critical factors for communication in the problem research, can be managed in a project. This section is concluded by communication planning which exemplifies how information distribution and sub-project integration can be planned for. The analytical model is exhibited in Figure 8.

![Analytical model](image-url)
3 Research method

In this chapter the research method used during this thesis will be covered. Each phase of this thesis is described in this chapter and in addition, the research approach and structure is further presented and lastly the research quality is presented and discussed.

3.1 Structure

The research method for this thesis follows a set of distinct phases according to Figure 9 below. Problem research aims to establish an understanding of the problem and the structure of the organization. Further, a literature study was carried out in order to increase the understanding and knowledge regarding inter-project learning, project risk management and intra-project communication, at the same time as the foundation for upcoming phases was set. The following data collection phase was based around interviews where the empirical foundation for the thesis was established. Finally, an analysis phase was followed out where the literature was applied to the empirical foundation which resulted in a discussion followed by a conclusion. The literature study, data collection and analysis were performed iteratively as the analysis often highlighted missing theory or data.

3.2 Research approach

Business research is based upon two methods, qualitative and quantitative research (Bryman & Bell, 2011). Quantitative research values quantification in data collection and analysis, whereas qualitative research emphasizes specific words (Yin, 2003). Further, qualitative research is based on evaluation, comparing and linking to develop new concepts or methods, thus a qualitative approach to this thesis was considered the most suitable option. This thesis focuses on specific values and perceptions for project management which makes a quantitative research method poorly suited. This study could however have been based on quantification by collecting data from project managers from the entire corporation, but this was not the expressed need by the employer. Another approach could have been to employ a combination between quantitative and qualitative research, but it was not considered an option since the complexity escalates quickly.

In research there are two main theories usually employed, deductive and inductive research. By deducing, the researcher depends on a set frame of reference which represents the knowledge and from there a hypothesis is developed and further tested to be true or false (Yin, 2003; Bryman & Bell, 2011). Conversely, inductive research generates theory from data and from there an analysis can be assembled (Yin, 2003; Bryman & Bell, 2011). For this thesis, a theoretical framework was built to enhance the knowledge base which also gave insight into
the empirical data collection. The theory was applied to the data which generated an analysis with some conclusions which in hand answered the research questions. Hence, this study contained fragments of both inductive and deductive research which is described by Bryman & Bell (2011) as common in these fields of research.

3.3 Problem research

During the inception of this thesis the author followed out a phase which had the purpose of obtaining a solid understanding of the problem which moreover led to a background and problem description. This phase was also meant to increase the understanding of Saab Dynamics as an organization as well as how R&D projects are operated at the project management office. The problem research phase mainly consisted of a large number of discussions with the supervisor at the firm combined with interviews with eight separate project managers. These interviews were unstructured as there was no need for a specific topic to be discussed, the goal was rather to get an insight into common issues. The company intranet, where all information regarding operation management is located, was used to further enhance the understanding of the organization and the problem. During the phase of problem research, a purpose was forged iteratively with its delimitations which at the end could be approved by employer and supervisor. Beyond purpose and delimitations, there was also enough information gathered to create a background and problem description.

3.4 Literature study

With a preliminary purpose well agreed upon, a natural next step was to reinforce knowledge in the area by performing a literature study. Linköping University’s resource UniSearch was used to find relevant literature. The literature study mainly focused on project risk management and communication within projects, although first some research in project planning and inter-project learning was conducted. For project planning key words such as “project planning”, “project inception” and “NPD planning” were used to find relevant literature. Continuing, a second search was conducted focusing on learning in between projects, especially in the planning phase and thus the search used key words such as “project learning”, “project planning learning” and “inter-project learning”. The first main search was centered around project risk management and to find relevant literature in this area the search used key words such as “project risk management”, “project risk maturity” and “project risk monitoring”. The last research area was intra-project communication. For this area finding relevant literature was bothersome since it concerns a rather narrow field of research on communication. Eventually success was achieved by adjusting the key words to be “project information flow”, “project integration” and “project communication planning”. The general idea was to gather research containing models and concepts slightly supporting each other rather than have a wide plethora of various models stating different findings. References used for this thesis are almost exclusively peer reviewed research articles. Many articles are relatively newly published although some are older. The newer articles were chosen because of their current relevance and the older articles because of their fundamental theories.

3.5 Data collection

Data collection was performed by interviewing selected project managers at Saab Dynamics to establish a foundation of how they work with risk management and intra-project communication. The choice to only interview project managers for the data collection was because of the possibility to gather individual learnings regarding project risk management and intra-project communication from project managers. The first step in the data collection phase was to identify suitable interviewees to provide useful data. This was done by first
stating desirable prerequisites which were set as having more than three years of experience of project management and having managed at least one project at Saab Dynamics. A list of project managers fulfilling these demands was constructed and then interviewees were selected in such a way that the data set would contain some project managers with more than 20 years of experience as a project manager at Saab Dynamics, some with experience as a project manager at other firms and lastly so the data set would contain project managers from different projects of various sizes and budgets which was agreed upon together with the supervisor at Saab Dynamics. Selected as interviewees were five project managers distributed over three different projects (three interviewees were sub-project managers for a major project). Information regarding the interviewees is displayed in Table 1. The interviewee from project 1 is the main project manager, no sub-project managers were able to participate in an interview. Similarly, the main project manager from project 3 was not able to participate. Upon discussions with the supervisor at Saab Dynamics it was decided the interviews would be anonymous because of the many security regulations at Saab Dynamics, the interviewees will therefore be called A-E from this point. The decision to anonymize the interviews was also because of ethical considerations since many people do not want to be pointed out publically. To present insight into the various projects, the project sizes were estimated. Any further information regarding the underlying numbers will not be presented due to security regulations.

Table 1: Interviewee information.

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Project containing sub-projects?</th>
<th>Project</th>
<th>Project size</th>
<th>Age</th>
<th>Education</th>
<th>Project manager experience Saab Dynamics</th>
<th>Project manager experience career</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Yes</td>
<td>1</td>
<td>Large</td>
<td>56</td>
<td>Computer science</td>
<td>20 years</td>
<td>10-12 years</td>
</tr>
<tr>
<td>B</td>
<td>No</td>
<td>2</td>
<td>Small</td>
<td>42</td>
<td>Information technology</td>
<td>6-7 years</td>
<td>1 year</td>
</tr>
<tr>
<td>C</td>
<td>Yes</td>
<td>3a</td>
<td>Small*</td>
<td>37</td>
<td>Mechanical engineering</td>
<td>9 years</td>
<td>4 months</td>
</tr>
<tr>
<td>D</td>
<td>Yes</td>
<td>3b</td>
<td>Medium</td>
<td>64</td>
<td>University degree</td>
<td>15 years</td>
<td>15 years</td>
</tr>
<tr>
<td>E</td>
<td>Yes</td>
<td>3c</td>
<td>Medium</td>
<td>38</td>
<td>Computer pedagogue</td>
<td>8 years</td>
<td>5 months</td>
</tr>
</tbody>
</table>

*Project 3 in its entirety is considered a large project

The interviews were semi-structured and an interview guide was composed before the interviews. The decision to have semi-structured interviews was due to the possibility to gain more knowledge and information out of the interviewees as the questions are more open-ended, which is supported by Sallnäs (2017). The questions for the interviews were constructed to gain insight into current and previous projects with regards to learning, risk management and intra-project communication. Further, the interview guide was iteratively developed after meetings with the supervisor at Saab Dynamics and Linköping University to make sure the questions would generate the desired results and avoid confusion during the interviews. Another method which was utilized to increase the quality of the answers was to send out the interview guide to each interviewee at least five days before the interview, this resulted in the interviewees being prepared and thus more capable of answering each question.
in a timely manner. During the interviews, each question was asked, the answer was noted and follow-up questions were asked at especially interesting answers. The time required for each interview was one hour. Straight after each interview the notes were complemented with additional thoughts and impressions from the interview. The most relevant findings were highlighted to simplify the upcoming analysis.

3.6 Analysis

In line with Sallnäs (2017) the interviews were analyzed qualitatively and quantitatively since the questions are open-ended. Sallnäs (2017) proposes a model consisting of five steps to effectively analyze the empirical results, these are collection, reduction, build dimensions, search pattern and examine conclusions. After collecting the data, there is a need for reducing the data into a more manageable size, only including data which can be useful to fulfilling the purpose of the thesis. Then the data was sorted into dimensions or headlines such as learning, risk maturity and communication tools. This was done to enable visual representation of the interviews to be able to see similarities and differences. A search pattern was applied to the categorized data to identify patterns and relations which led to possible conclusions. These steps, from reduction to conclusion, were performed iteratively as recommended by Sallnäs (2017) which enabled a sound conclusion to be made.

3.7 Research quality

The quality of a qualitative study such as this can be determined by analyzing validity and reliability. Internal validity is defined by Yin (2003) as to what degree the results are factual, meaning to what degree the results are a correct reflection of reality. Efforts done to increase the internal validity were for instance to send out the interview guide to each interviewee beforehand which made it possible for the interviewees to prepare and thus answering the questions more accurately. Possible disadvantages from sending the interview guide before the interviews could be that the interviewee over-analyzed the answers to make the project look flawless. The fact that the interview guide was created iteratively between meetings with both supervisors also increased the internal validity of this thesis. Lastly, the notes from the interviews were complemented with additional thoughts straight after each interview which led to reduced loss of impressions. By recording the interviews the internal validity could have been further increased since there is practically no loss of information, but due to the strict security considerations and regulations at Saab Dynamics this was not a feasible solution. The internal validity could further have been increased by collecting data from other parts of the organization and not just from project managers, which could have provided additional perspectives. Time constrictions for the author in combination with scheduling difficulties for possible interviewees resulted in additional interviews not being carried out.

Yin (2003) defines external validity as to what extent the thesis can be applied to other situations or other firms. The external validity of this study is limited since only one firm is analyzed, thus application on other cases can be difficult. With more time and resources the study could have been expanded to include multiple cases which would have increased the external validity. Some efforts have however been made to enhance external validity, namely to focus on topics (project risk management and intra-project communication) which tend to be challenging for many firms to manage, thus to some extent this study can be applied to other firms developing complex products in projects.

Reliability is defined as to what extent any measurement could be achieved repeatedly, the optimal situation is where the measurement would yield identical results every time, thus it is the trustworthiness of the measurement (Rosengren & Arvidson, 2002). For the purpose of
this thesis the reliability is considered as the extent to which the study could be repeated and yield identical results. For a study of this type, being able to arrive at identical conclusions is virtually impossible since the large number of social variables generated by utilizing interviews to collect data; however the reliability of this thesis is strengthened by other means. Interviewees were selected from various projects and with various backgrounds in order for the interviews to yield a more accurate representation of the organization, conducting more interviews would thus most likely not have increased the reliability of the results. Further, the methods and theories used in this study have been explained in detail which will enhance the chance of replication and also the reliability of this thesis.
4 Empirical findings

In this chapter, the empirical data gathered from the interviews will be presented. First is a section shortly describing relevant company information about Saab Dynamics.

4.1 Company description

This section will present some information in regards of the case company Saab Dynamics along with relevant operations.

Saab Dynamics AB is a corporation within Saab Group focusing on the marketing, development and production of military and civil products. Their product portfolio is wide, including missile systems, ground combat weapons, torpedoes, military simulation systems, camouflage and unmanned underwater vehicles for military and civil use. The operations are divided between several locations in Sweden where Linköping focuses on missile systems and underwater products and Karlskoga focuses on ground combat weapons.

The organization is divided into business units where each product area has its own unit. Further, the organization consists of departments for development, procurement, production and various administrative functions. Fixating at the development department, it consists of several functions essential for the development process. At the development department there is a project management office where all development projects are planned and executed by project managers. The project management office consists of one division for project management which focuses on project execution and one division for project support which supports projects regarding planning, risk management, calculations and administration. Development projects are owned by the various business units and are specified by assignment.

There is a company-wide management system called GMS (global management system) where all operations are described. GMS states that all projects are to be carried out according to a waterfall model consisting of three stages of preparation, execution and conclusion. Dispersed during these stages are eight decision points where it is decided whether or not a project is ready to progress. These decision points contain detailed descriptions on what is required to pass. GMS further provides demands on how processes like risk management are to be managed in projects, although these processes are described in a general manner and it is assumed that each project manager will tailor the general processes to the individual project. Many regulations exist within the organization as a result of the amount of classified information being handled. This prevents employees from working as they please and limits available methods for both risk management and communication.
4.2 Collected data

This section will present the data collected from the five interviews which are the individual learnings regarding project risk management and intra-project communication. The data will be structured according to the areas covered in the theoretical framework. The key empirical findings are summarized into Table 2 below.

Table 2: Key empirical findings.

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>When does learning occur?</td>
<td>Post-project</td>
<td>Post-project</td>
<td>Continuously</td>
<td>Post-project</td>
<td>Continuously</td>
</tr>
<tr>
<td>Strength in risk management</td>
<td>Mitigation</td>
<td>Mitigation</td>
<td>Identification, analysis</td>
<td>Identification, analysis</td>
<td>-</td>
</tr>
<tr>
<td>Weakness in risk management</td>
<td>Monitoring</td>
<td>Monitoring</td>
<td>Monitoring</td>
<td>Mitigation, monitoring</td>
<td>Monitoring</td>
</tr>
<tr>
<td>Top management communicating the risk process?</td>
<td>No</td>
<td>Via risk manager</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Does project team naturally think about risks?</td>
<td>Slightly above average</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>What does the continuous risk process look like?</td>
<td>Live document containing current risks</td>
<td>No continuous risk management</td>
<td>Backlog which is updated by project team</td>
<td>No continuous risk management</td>
<td>Assessments throughout the project</td>
</tr>
<tr>
<td>Functional or project matrix?</td>
<td>Project</td>
<td>Project</td>
<td>Project</td>
<td>Project</td>
<td>Project</td>
</tr>
<tr>
<td>Tools to distribute information</td>
<td>Meetings, wiki, board</td>
<td>Meetings, board</td>
<td>Meetings, backlog, board, stand-ups</td>
<td>Meetings, conversation, mail</td>
<td>Meetings, backlog, conversation, mail, board</td>
</tr>
<tr>
<td>Methods for integration</td>
<td>Co-location, document, meetings</td>
<td>-</td>
<td>Special group</td>
<td>Document, meetings</td>
<td>Document, meetings</td>
</tr>
<tr>
<td>Project team co-located?</td>
<td>Relatively co-located</td>
<td>Mixed</td>
<td>Completely</td>
<td>Mixed</td>
<td>Completely</td>
</tr>
<tr>
<td>Project using a communication plan?</td>
<td>Yes, although shallow</td>
<td>Yes, follows it completely</td>
<td>Yes, updating continuously</td>
<td>Only main project</td>
<td>Meeting plan</td>
</tr>
</tbody>
</table>

4.2.1 Learning in project-based organizations

Little or no time is spent evaluating projects according to all the interviewees and the biggest reason for this is the time factor where reviews are not prioritized. Interviewee D states that he/she spends about 40 hours per project evaluating projects and project managers are urged
to write a post-project report including what have gone well during the project. Interviewee B states that these reviews do not happen after every project and Interviewees A, C and D explain how the reports are stored away and no one ever utilizes the information. The post-project evaluation process is considered highly important since it contributes to learning. Interviewee A states that a missing reviewing process will result in effective methodologies not being shared to other projects. About 5-10% of the total project length would be appropriate as evaluation time. The possibility to have a continuous approach to learning was recognized by Interviewees C and E as both consider it to be better than having one single reviewing point. Interviewee E thinks four hours per month should be spent on evaluation.

The interviewees wish for a bank of knowledge containing experience from all projects which can then be used when necessary, larger projects should “unload” knowledge at set points during the projects. This bank, according to Interviewee B, should also contain normal values which can be useful for other projects. Despite no structured approach to learning, the interviewees utilize personal experience from previous projects which is mainly focused on leadership factors, common problems and planning.

4.2.2 Project risk management

Risk maturity

Of the four phases in risk management (identification, analysis, mitigation and monitoring), two interviewees (A and B) considered the mitigation part to be particularly strong in their projects. Two other interviewees (C and D) considered identification and analysis to be their strength. For weaknesses in the risk management process, Interviewee D states that the mitigation part is lacking in certain situations where the risk can be easily identified but then no one ever takes the time to properly mitigate that risk. All interviewees consider risk monitoring to be poor or even non-existent. Interviewee A and C both think risk monitoring is happening at some degree, but this is not formally documented.

Interviewees A and C clearly state that there is no structured approach to managing risks in the organization and mean that this should be clearer. Interviewees B, D and E mean that there is a structured approach for risk management, but they do not consider the process to reach all the way down to project level. The organization is putting some effort in strengthening the knowledge and awareness of risks by appointing a risk manager who can assist in improving the risk management process, although the risk manager is currently assigned to one single project and two interviewees (C and E) state that there is no clarity in what the risk manager is expected to do. Interviewees C, D and E have seen an improvement in the structure of risk management since the risk manager was assigned to the project. It is stated by Interviewee B that the organization does provide occasional seminars and courses for risk education purposes. Interviewees D and E explain how the entire risk management process is completely in the hands of the individual project and thus the organization do not contribute towards strengthening the knowledge of risk management. The general consensus among the interviewees is that there is barely any work done by top management to improve the risk management process, other than appointing the previously mentioned risk manager. Two interviewees (C and E) state that it is highly unclear whether or not the process is improving since they do not have much affiliation with top management.

Dimensions used to analyze risks are probability and consequence in terms of money and time. Interviewee A finds risk assessments and evaluations overrated since it is an estimation which will never be true, thus Interviewee A means that less focus should be on assessing risks. Interviewees C and E have identified cost as the single most important factor in prioritizing risks, even though other factors can be more crucial. No external actors outside of
the project are involved in the risk management process, although some exceptions exist. For example, Interviewee A usually meets with other project managers to make sure no other project will have to use the production facility at the same time.

**Risk culture**

When discussing the topic of risk culture, four interviewees (A, C, D and E) state that top management does not have any particular attitude towards risk since barely any communication is occurring. Interviewee C further explains how top management seems to be mostly concerned about monetary values rather than the process itself. Moreover, top management does not communicate how risks are supposed to be managed according to four interviewees (A, C, D and E). One interviewee (D) explains how it is the responsibility of each project to set up a process for managing risks. It is identified by Interviewee B that top management is passively communicating how risks are supposed to be managed by employing a risk manager.

The project teams have a varying view on risks, although most project members have nothing against working with risk management. Interviewee A says that the project team is bad at documenting the work and Interviewee D thinks the project team has a good understanding of the technology and thus can identify risks effectively. Interviewee C recognizes his/her project members as good at managing technical risks but relatively bad at economic risks. As a whole, project members do not find it completely natural to have risks in mind behind every decision. Interviewee A finds the project team to be “slightly above average” at naturally thinking about risks. Two interviewees (D and E) state that their project teams find it natural to think about risks since the teams have plenty of experience with the technology.

All interviewees find their respective project teams to be resistant towards working according to a set framework for risk management. According to Interviewee A, there is a tendency for project members to ignore processes for risk management and instead do whatever the project member finds most efficient, such as not updating documents when it is supposed to be done. Interviewee E highlights how project members sometimes are unaware of how the process actually looks like and are thus unable to perform a task according to the set standard.

**Risk monitoring**

Projects led by Interviewee A manage continuous risk management by updating the risk analysis with probability and consequence, approximately once every month. Interviewee A recognize a resistance to continuously update the risk analysis from some project members, thus Interviewee A wants to have a risk manager appointed to his/her particular project to enforce the process. Interviewee A utilizes a live document to communicate the risks to the project team. This document contains only risks critical for the present and near future to keep the project team focused on what is important right now. Further, Interviewee A has bad experience from using large meetings to update and evaluate the risk analysis, the preferred approach is rather to individually or in small groups update, evaluate and make the appropriate changes to the document. Interviewee A has thought about motivating the project team to better manage risks continuously by presenting some information about the result of their risk management process, although currently there is no implementation of this approach.

Interviewee B elaborates on how the budget and time plan prevents the project from doing any continuous risk management. The risk analysis which is established pre-project will basically be fixed throughout the project, only obvious updates will result in a minor change in the analysis. Interviewee D states that the project is not good at managing risks continuously throughout the project. The only aspect of continuity is the risk manager who suggests
mitigations and checks whether any changes have happened regarding identification and risk analysis.

A concept of utilizing a backlog for managing risks continuously is used by Interviewee C. Project members are urged to update the backlog whenever a change in either probability or consequence is noticed. The project team is also urged to add newly identified risks to the backlog according to Interviewee C. The backlog is sorted according to what risks are most critical and for top risks communication is increased on how to proceed to mitigate those risks or monitor them.

The process for continuous risk management used by Interviewee E consists of assessments which occur at set points throughout the project. During these assessments new risks are identified by the project team and quantified by probability and consequence. During the upcoming assessment changes to the risk landscape are discussed and the risk document is updated accordingly, either by updating probability and consequence, or by removing the risk completely. Interviewee E complains that the discussions and prioritization regarding risks is only based on money and cost, which is the will of top management.

The interviewees were also asked whether projects or functions have most influence in this matrix organization, the answer was without any doubt projects by all interviewees. Interviewees C and D pictured the functions as consultants to the projects who merely allocate resources and stated that functions do not exist in the traditional sense.

4.2.3 Intra-project communication

Information distribution

To distribute information to all project members, project managers at Saab Dynamics utilize a plethora of various methods. Regular project meetings are used by most interviewees at intervals of every other week (A, C and D) and when required (B). The larger projects have pulse-meetings every week where the focus is on resources and problems. Interviewee C uses short stand-up meetings every day and the purpose is to cover what everyone have done since the last meeting, what everyone is supposed to do after the meeting and if there are any issues. The effectiveness of project meetings is considered low (A, C and E), but Interviewee C state that project meetings cannot have a high effectiveness since the purpose is only to spread information. Interviewee E means that the meetings are not effective since he/she wants to let everyone express their opinion, this sacrifices effectiveness for innovativeness according to Interviewee E. Two interviewees (B and D) consider their project meetings to have rather good effectiveness and Interviewee D sends out the presentation slides to enhance the effectiveness further. Interviewee C means that the daily stand-up meetings are considerably more effective than longer project meetings, but the purposes of these meetings are different. Other than project members, the project managers try to invite people with a relevant role to the project meetings to achieve higher effectiveness. Interviewee A usually invites people from quality and configuration management to the meetings to allow for appropriate knowledge to be available. Interviewees B and C adapt meeting attendees to the content of the meeting. A technical management team with the appropriate knowledge is attending to meetings by Interviewee E.

Interviewee A means that some project members tend to not take in information from straight meetings, thus he/she utilizes a combination of meetings and other communication tools such as the project wiki. The goal according to Interviewee A is to reduce the amount of meetings and increase other communication to increase effectiveness and ensure complete information coverage among the project team. Two interviewees (C and D) are not sure whether or not project members can absorb information through meetings, but Interviewee D tries to improve
this by sending out the presentation slides and Interviewee C tries to utilize smaller groups and rooms to better involve all project members. Interviewee B is certain that not all project members can absorb enough information by meetings and Interviewee E thinks that most project members can take in information through the project meetings.

Aside from meetings, Interviewee A uses a project wiki to distribute information across the project team, this webpage is accessible by all project members. Interviewee A experiences this method as well-suited for new project members and for larger projects since all information is gathered in one place. A project backlog is utilized by Interviewees C and E to communicate the various tasks and their respective priority. Two interviewees (D and E) rely heavily on direct conversation as a method for distributing information as this reduces the risk for misunderstandings. Simple e-mails are used by Interviewees D and E and Interviewee D clarifies that e-mails are only sent to those project members who can benefit from the information since information overload is common among certain project members.

A project board is used by four interviewees (A, B, C and E), where Interviewee C is currently using an electronic board since no room is available for a physical board. Interviewee D states that no project board is used in his/her sub-project, but there is one at the level of the main project. These project boards contain information on time plans (A and B, E wants to implement it), current tasks (B, C and E), technical specifications (A), requirements (B) and progression (C and E). Interviewee A states that the time plan is a particularly difficult challenge for the project, thus the time plan is included on the project board. Interviewees C and E update their respective project boards whenever there is a change in the backlog and Interviewees A and B updates the boards frequently to include relevant and updated information.

**Sub-project integration**

Four interviewees (A, C, D and E) are part of projects consisting of several sub-projects. Interviewee A is located in the same shared office as all sub-project managers for that particular project which, according to Interviewee A, allows for better integration which is important due to the uncertainty of development projects. There is plenty of informal conversation between the sub-project managers as a result of this co-location which Interviewee A considers as positive for integration purposes. Interviewees C, D and E are all sub-project managers for another project and are not co-located to the same office. Interviewee E explains how it would be beneficial for sub-project managers to be co-located since the sub-projects would become more integrated with each other as a result of being able to communicate with ease. According to Interviewee D, the various sub-projects do not have much to do with each other and thus not much communication is needed.

Three interviewees (A, D and E) are using documents as support for integration. Interviewee A has adopted a system of using an excel-sheet covering technical details concerning several sub-projects. This document displays which sub-projects need to communicate regarding a technical detail and each sub-project can edit the document with specifications. Interviewee E states that their document is a time plan with the various sub-project interactions mapped out.

A special group with the purpose of managing integration between sub-projects is used by Interviewee C. According to Interviewee A, it is hard to identify which sub-projects will require special integration at the project start, but it becomes clearer as the project progresses and thus changes will have to be made to the integration document accordingly. Interviewee E states that it is relatively easy if you have experience to identify possible dependencies at project start, but some can be unclear. Meetings is one approach to sub-project integration which is applied according to Interviewees A, D and E and according to Interviewee E many
meetings are spontaneous. Interviewee A explains how the integration meeting includes all sub-project managers for the project and is scheduled every other week.

Despite not having any sub-projects in his/her project, Interviewee B still sees similar integrational components but between individual project members. Interviewee B recognizes informal communication as a key success factor for having an integrated project team and this can be achieved through having the project members co-located. The project team is mixed at the moment although Interviewee B wants to have all project members located at the same place. Interviewee A says that most project members are relatively co-located since there are a few separate floors dedicated to the project. The project team under Interviewee C is completely co-located, but it changes according to the current tasks to allow for an appropriate environment. Interviewee D has his/her project team dispersed, although some of them are co-located and most of them are within the same vicinity. Interviewee E states that his/her project team is completely co-located and the only change occurring is when new members join the team. Further, Interviewee E recognizes that project members are worryingly bad at sharing knowledge between each other.

Communication planning

According to all interviewees, a communication plan is written in association with the project plan in the project planning phase. Interviewee D adds that only the main project does however have a communication plan, not the sub-projects. It is hard in the opinion of Interviewee A to plan ahead for such a large project regarding communication, the communication plan is thus shallow and contains little useful information. Interviewee A finds that updating and customizing the plan during the project is a much more useful approach. According to Interviewee C, the communication plan for his/her project is constantly changing to better suit the current situation. The project under Interviewee B does utilize a predetermined communication plan which is functioning well according to Interviewee B.

The communication plan is constructed differently for each project according to three interviewees (A, B and D). Interviewees A and B both state that the plan only concerns internal communication such as meeting structure, but not much more of other information distribution tools. How the project will communicate with other stakeholders is something that becomes clear over time, no particular planning is done for this. As stated by Interviewee E, the communication plan as of currently is more of a meeting plan which states how and when project meetings will occur.

Other than the information above, the interviewees did not have sufficient knowledge regarding communication planning to answer the questions satisfactory. Hence, this section cannot be expanded further.
5 Analysis

In this chapter, the empirical findings will be analyzed using the theoretical framework. The analysis is structured according to the theoretical framework to easily be able to connect the analysis to the research questions.

5.1 Learning in project-based organizations

The following section will analyze the empirical findings regarding learning in project-based organizations by using the theories of learning in project-based organizations. The analysis purposes to create a model for how project learning can be improved.

Empirical data from interviews with five project managers showed united evidence towards projects having the majority of the influence in the organization. Moreover, some interviewees do not consider the organization to have any actual functions as they are merely consultants who are responsible for providing resources. By comparing this data to the various organizational forms in the model by Hobday (2000), the described organization is somewhere between a project-led and a project-based organization. Generally for development projects at Saab Dynamics, learning is a problem area which is what Hobday (2000) identifies as a common situation for project-based organizations. A possible solution which Hobday (2000) brings forward is to redesign the organization by creating or strengthening the various functions. In this scenario, the solution would imply a redesign towards a pure project-led organization with actual functions instead of the consultant-like role which the interviewees describe functions to have currently. Projects would still have a higher status than functions but there would be a place where learning structures could be located.

The project management office at Saab Dynamics has employed a risk manager recently to assist in strengthening the risk process. At Saab Dynamics, the project management office can be seen as a function, thus the employment of the risk manager can be seen as an effort to strengthen the functions. This means that Saab Dynamics might be aware of the negative effects weak functions bring and that there currently are active efforts to progress back to a project-led organization with stronger functions. Although, the main purpose of appointing the risk manager was likely not because of noticed learning issues, but more likely a result of a lacking risk management process. More efforts are however needed in order to strengthen the functions with structures and procedures supporting the projects. It is important for Saab Dynamics to realize that learning requires actual functions, not just weak consultants with the sole purpose of distributing resources. Hobday (2000) means that learning cannot be achieved when managed solely in individual projects since they do not have much to do with each other and thus there is no opportunity for inter-project activities creating knowledge. Functions on the other hand are involved in most projects and thus can facilitate activities for inter-project learning.

In the theoretical framework a distinction of a twofold definition of learning is presented including post-project review and continuous improvement. The empirical findings display a similar division as some interviewees clearly prefer and apply continuous learning in the form of regular reviews every month, while the set framework for learning is based on post-project reviews. Advantages of using post-project reviews, according to the theory by Goffin & Koners (2011), are that there exists information from previous projects which can be utilized by new projects, specifically during the planning phase where there are many uncertainties. This advantage is recognized by some interviewees who consider the post-project reports to be vital for sharing knowledge and facilitate for other projects. Two other interviewees
recognized the benefit of applying continuous learning by setting aside a small amount of time every month where the project is reevaluated and thus can be improved. Stein & Vandenbosch (1996) also recognize the ability to improve the project as it progresses as the main benefit of continuous improvement. However, for the purpose of learning from previous projects in project planning, learning in between projects is the focus even though improving ongoing projects obviously is not disadvantageous, and thus post-project reviews become essential according to the theory by Goffin & Koners (2011).

Goffin & Koners (2011) identify that post-project reviews result in tacit knowledge being converted into explicit knowledge, which is referred to as externalization in the model by Nonaka (1994). Tacit knowledge, as knowledge accumulated during a project, is generally difficult to share but the concept of utilizing post-project reviews is one approach to convert the tacit knowledge into explicit knowledge, which then can be shared with ease. The problem though, according to the empirical data, is that the explicit knowledge is not being utilized after it is documented and thus the purpose of the entire concept is wasted. The idea of learning is to utilize the explicit knowledge generated from the reviews in new projects, which would be similar to the concept of internalization in the model by Nonaka (1994). Internalization is regular learning, or learning by doing, which comes natural to most people. Thus, it is unlikely that the natural part of learning is hindering the post-project reviews from being utilized, which motivates a deeper analysis of the externalization process. The consensus from the interviewees points to that post-project reviews are barely ever done properly, if ever done at all, since there is not enough time dedicated to reviewing projects. As a result of this, the process of externalizing the tacit knowledge gathered during the project most likely suffers and the resulting explicit knowledge might not correspond well to the original tacit knowledge. Hence, in line with the theory by Goffin & Koners (2011), projects need to spend time to thoroughly review and document by using metaphors. By telling stories, metaphors can naturally emerge according to the theory by Sakellariou, Karantinou & Goffin (2017). This could allow for the post-project report to better reflect the tacit knowledge and moreover be internalized with greater success in new projects. If post-project reviews could be structured as described above, a bank of knowledge could be created of all explicit knowledge which is what several interviewees wanted as a result of inter-project learning. The bank containing explicit knowledge could then easily be understood and utilized by other projects in need.

This section covered two options for learning where both post-project reviews and continuous improvement are recognized by theory and empirical data. Figure 10 illustrates these two options along with some important concepts for each. These concepts are all results of the above analysis. Further, this section analyzed issues regarding learning for project-based organizations which is a theoretical concept.
Figure 10: Concepts for improving learning in project-based organizations.
5.2 Project risk management

This section will analyze the empirical findings under project risk management by applying the corresponding theories found in the theoretical framework. The analysis purposes to create a model for how risk monitoring can be improved by various means.

5.2.1 Identifying the risk maturity phase

The risk maturity model proposed by Yeo & Ren (2009) consists of the five phases ad hoc, initial, defined, managed and optimizing. All interviewees clearly state that there is a recognized need to identify and mitigate risks, which according to the model by Yeo & Ren (2009) means the criterion for initial is achieved. Further criteria for achieving the initial phase is by recognizing the need for risk management and thus the second phase is achieved also under these conditions since the need for risk management is clear. The second phase also contain information on what a firm is missing if it still is in this phase, which is a clear structure for risk management and effort to establish an organization-wide risk management process. Three interviewees consider the organization to have a structure for managing risks and the remaining two (where one of them is the most senior project manager at Saab Dynamics) definitely do not see any structure. Hence, it is unclear whether or not the second phase is surpassed, but the majority of the interviewed project managers recognized a structure which in combination with the fact that there is a structure for managing risks makes it likely that the second phase is surpassed.

Phase number three, which is called defined, requires three different criteria to be fulfilled: (1) having a formalized approach in managing risks, (2) analyzing risks and (3) providing education about risk. As covered above, the interviews do not contain clear evidence that there actually is a formalized approach to risk management. However, evidence from three of five interviewees combined with the fact that GMS is providing some degree of structure for the risk management process, result in this first criterion being achieved. The second criterion is without doubt fulfilled since all interviewees use probability and consequence to analyze risks, with some other factors included from time to time. Evidence for the third criterion is somewhat contradictory since two interviewees do not consider the organization to provide any education or knowledge creation, even though a risk manager was recently employed with the purpose of improving the risk management process across projects. Since the organization is in fact providing seminars with the purpose of enhancing the knowledge and awareness of risks, the third criterion is however achieved. All interviewees consider the projects to have more influence than the functions and that functions barely exist, which would suggest that the organization is project-led which is in line with Yeo & Ren’s (2009) model as they propose project-focused matrixes to usually be in the defined phase. As with the second phase, there is information on what a firm is not achieving by being in the third phase, which is the ability to carry out the risk management process in every project. The evidence from the three interviewees who considered the organization to have a structured approach to risk management, show that this structure is not followed through by the projects. Thus, the model for risk maturity would suggest the maturity level to stay at the phase of defined.

One step above is the managed phase which is considered to be reached when the formalized risk management process is followed through consistently for all projects. As discussed above, the empirical evidence proves this is not the case and thus the phase of managed is not achieved. However, three more criteria exist for achieving the fourth phase, namely through (1) assessing, analyzing and monitoring every aspect of risks, (2) involving internal and external stakeholders in the risk management process and (3) there is a culture of risk awareness in the organization. Starting at the first criterion, all interviewees in unison
explained how risk monitoring is lacking and one particular interviewee even stated that the assessing and analyzing of risks is overrated, which leads to believe that the first criterion is not fulfilled. For the second criterion, none of the selected interviewees involved any external stakeholders in the risk management process, with the exception of one interviewee who merely contacted other projects to reduce the risk for other projects occupying the production facility in time for production. Yeo & Ren (2009) mean external stakeholders to be customers for instance and there is no empirical evidence for customers or similar external roles being involved, however data on whether or not internal stakeholders are involved is indecisive. The third criterion is more complex and thus there is a separate section dedicated for this phenomenon, but in short there is no culture of managing risks as all interviewees state that project members do not find it natural to think about risks when making decisions. Thus, the third criterion is not fulfilled either which indicates that the managed phase is not reached. There is a phase of optimizing which follows the managed phase and it is reached according to Yeo & Ren (2009) when a firm is using internal and external innovation to continuously improve the risk management process. From the interviews, it was shown that the risk management process is barely being improved, the only improvement factor being the recently employed risk manager. Even though the risk manager is one step in improving the process, no other improvement efforts can be identified and thus no component of the fifth phase is reached which further implicates that a risk maturity of phase three is viable.

![Risk Maturity Model](image)

Figure 11: Synthesized risk maturity model, identified phase in bold.

5.2.2 Progressing in risk maturity

According to the analysis above, the projects at Saab Dynamics are of the risk maturity level defined, which is phase three in the model depicted in Figure 11. Thus, this section will focus on activities for progressing to steps four and five. The proposed activities for progressing to the managed phase according to Yeo & Ren (2009) are to involve key stakeholders in the risk management process and improving risk culture. Currently, no external stakeholders are involved in the risk management process and thus it is suggested that key customers and suppliers should be involved in the process. Further, Yeo & Ren (2009) mean that a risk culture has to be established or improved and how this is done is covered in more detail in the following section below. However, according to Yeo & Ren (2009), one of the key contributors to culture can be to appoint a risk manager who can actively improve the risk management process and this is something which is already done by the project management office at Saab Dynamics. This can indicate that there are in fact some efforts currently being done to progress in risk maturity and establishing a risk culture. Although, as one interviewee stated, the risk manager is currently involved in one project and thus most projects will not reap the benefits of having a risk manager. To truly progress in risk maturity, it would thus be required to have one or several risk managers supporting all projects. If the fourth phase would be achieved, Yeo & Ren (2009) also propose activities for progressing to the final phase. The most important aspect for this phase is continuous improvement and focus on
process innovation. The best approach to accomplishing this is through a high degree of involvement of top management since only they can establish routines for improvement and get the attention of the entire organization. According to the empirical data, top management is not particularly involved in the risk management process, nor do they make efforts to achieve process innovation and thus there are currently no signs of efforts to progress to the final level of risk maturity.

The three areas which Yeo & Ren (2009) further identify as important for progressing risk maturity are culture, process and technology. To improve the process area, the organization needs to focus on risk identification, risk analysis, risk mitigation and risk monitoring and make sure that the capability for each of these is adequate. At the project management office, it is recognized that the risk management process needs to be improved, which is one step in improving the process. This thesis is one attempt to identify and improve the process and this will further be covered below in the risk monitoring section. Considering the technology area, project members generally have a high level of technical understanding according to the interviewees which increases the chance of the risk identification and analysis to be correct. The final area is culture which will also be covered in a separate section below. Yeo & Ren (2009) mean that these three areas require substantial and equal attention in order for the risk maturity to progress. Following the reasoning above, more effort is needed in the process area where the focus of the organization should be to enhance the risk management process and ensure that each step is working to satisfaction.

5.2.3 Building a risk culture

Information gathered from the interviews showcase little awareness of risk among project members which could indicate a weak or even non-existent risk culture according to the theory by Roeschmann (2014). Moreover, four out of five interviewees experience no attitude towards risk from top management which, according to the theory by Pan, Siegel & Wang (2017), would also mean there is no clear culture of risk management in place. Roeschmann (2014) considers the risk culture to determine all actions associated with risk management despite a potential process stating otherwise. A missing risk culture could explain why the established guidelines for risk management in GMS and the structured approach to risk management, which according to empirical evidence does not penetrate the organization, are not being used in projects, according to the theory by Roeschmann (2014). The empirical data further shows a possible lack of communication from top management regarding risk management which results in no specific risk behavior being rewarded which, in line with another theory by Roeschmann (2014), prevents a risk culture from being developed through learning.

The three factors identified by Bozeman & Kingsley (1998) to be affecting risk culture the most is in Figure 12 combined with Roeschmann’s (2014) three factors creating the risk culture. Starting with the first factor by Roeschmann (2014), artifacts, it is the procedures projects are urged to utilize for risk management which are set in place by top management. In this case, the empirical data show some set procedures for managing risks, although these are not penetrating the organization and are too general for projects to adapt. Further, top management seems to be mostly concerned about the monetary value of managing risks and not the process itself which could imply that top management does not consider the artifacts enough. Since artifacts is one essential factor creating the risk culture, top management needs to clarify the processes to allow a risk culture to form. The second factor according to Roeschmann (2014) is espoused values which is how top management is communicating the artifacts to ensure them being followed. Above it was established that there are in fact some (although probably not enough) artifacts, but despite this most project managers seem to think
that there is not any set approach to manage risks. In line with Roeschmann’s (2014) modeling of espoused values, this could mean that the main problem inhibiting the risk culture is the communicating of the artifacts and not the artifacts themselves. This implies if top management could enhance the communication of how risks are supposed to be managed, the artifacts might not have to improve as much. By appointing a risk manager, the organization has enhanced the espoused values factor since one interviewee recognizes this as one approach for top management to communicate. The last factor in Roeschmann’s (2014) theory is basic assumptions which is also perhaps the most determining factor for the actual risk culture. According to the empirical data, there is a resistance among project members to work according to a set framework regarding risk management. Roeschmann’s (2014) model would consider this to mean that the artifacts do not successfully reach the project members, instead their own opinions for how risks are supposed to be managed are taking over. Information from the interviews also show that project members sometimes do not even know what process (artifact) they are supposed to use which further leads to basic assumptions among project members not being in line with the artifacts. This inconsistency between artifacts and basic assumptions is according to Roeschmann’s (2014) theory often caused by poor espoused values which further implies that an improvement is required. Yeo & Ren (2009) propose appointing a risk manager for a purpose such as this and it is something which is already done. Although, as some interviewees state, there is not really any clarity in what the risk manager is expected to do which could imply that top management is not using the risk manager to accurately communicate the artifacts which is identified by Yeo & Ren (2009) as vital. Despite this, the projects which have utilized the risk manager have experienced an improvement in the risk management process with the structure being slightly clearer. Thus, the recommendation to build or improve the risk culture is to make sure that the risk manager is accurately communicating the set structure by top management (Yeo & Ren, 2009) but also that each project has the ability to get assistance from a risk manager, possibly by employing yet another risk manager. The written process in GMS for risk management also needs to be clarified, in line with Roeschmann (2014), to enable each project to easily implement the artifacts.

Figure 12: Factors deciding and affecting risk culture, Roeschmann’s (2014) factors combined with Bozeman & Kingsley’s (1998) factors.
Bozeman & Kingsley (1998) found three factors affecting risk culture more than others. The empirical data show that each project is responsible for structuring its own risk management process, which can be viewed as top management trusting the projects and thus, according to Bozeman & Kingsley’s (1998) theory, the risk culture will be positively affected. As previously mentioned, empirical evidence show an inability for top management to communicate the set risk management process, which Bozeman & Kingsley’s (1998) theory would consider as unclear mission since the true purpose behind the risk management process is not communicated to project managers. To improve this factor and contribute towards a risk culture, there is a need for top management to clearly state the purpose of the process for risk management. This is also one approach which Roeschmann (2014) sees as critical for the artifacts to be successfully converted into basic assumptions since people need to understand the purpose of an action in order to carry out the action optimally. As described by the empirical data, a plethora of regulations exist in the organization which complicates every decision and action. As these regulations complicate decisions and actions, they can be seen as regulations impeding effectiveness, which is one factor Bozeman & Kingsley (1998) model as having a negative impact on risk culture. In this particular case of Saab Dynamics, most regulations are externally controlled by authorities and thus cannot be changed or removed easily. As a result of this, this factor affecting risk culture will be considered static and unchangeable.

To summarize the various factors affecting risk culture, espoused values was identified as the weak link in the model by Roeschmann (2014). By improving this area, the artifacts would potentially be enhanced and would be more likely to be converted into basic assumptions. Of the factors Bozeman & Kingsley (1998) propose, top trust was identified as already in place and procedures impeding effectiveness was set to be unchangeable, but the area of clear mission has room for improvement.

5.2.4 Improving risk monitoring

As Cagliano, Grimaldi & Rafele (2015) propose, risk monitoring requires a certain level of risk maturity which is illustrated as the fourth phase in Figure 11. Continuing, to progress to that specific level of maturity, a culture of risk management is required according to Yeo & Ren (2009), which was also covered above. There are however other factors to consider to enable risk monitoring of which some will be covered here.

Zou, Wang & Fang’s (2008) model for risk monitoring states that the risk landscape continuously needs to be reassessed for changes, in order for the risk analysis to be constantly relevant. These changes include risks which are no longer relevant, new risks and risks which have changed in probability or severity. A method used by one interviewee, who uses continuous assessments throughout the project, closely resembles this model as the assessments are looking for new risks and changed probabilities and consequences. Another concept for monitoring used by an interviewee is to only communicate currently relevant risks to the project team. This effort is also in line with the model by Zou, Wang & Fang (2008) since the project team will always be updated on relevant risks with relevant mitigation plans. Similarly, the approach used by a third interviewee, to use a backlog for continuous risk management, prioritizes the risks which also enables the project team to focus on the most critical risks for the current situation. As most interviewees also utilize project members to identify and analyze risks, the quality of the risk management process should be heightened according to the theory by Zou, Wang & Fang (2008).

The model proposed by Kaliprasad (2006) to be suitable for continuous risk monitoring includes the three factors of reviewing expected losses, avoided risks and mitigated impacts. According to the empirical data, these factors are currently not being used in the risk
management process. To improve the phase of risk monitoring in the risk management process, these factors could be included in projects at set points. Since one experienced project manager did not consider large meetings for monitoring risks as a good idea, the concept of smaller assessments utilizing smaller groups could be utilized. Although, for the purpose of reviewing the risk process, larger meetings could be beneficial since it mostly is about distributing information. During these meetings, the project manager could present how the expected losses have evolved since the last meeting and thus how well the risk action plan is working. Moreover, the project manager could also present a chart with completely avoided risks and impacts which have been mitigated. This concept is proposed by Zou, Wang & Fang (2008) to increase learning and improve the monitoring process, but it could further function as a motivational factor by demonstrating the effectiveness of the risk management process to the project team, which is something that one interviewee have thought about.

Throughout this chapter several concepts for ultimately enhancing risk monitoring have been covered. Figure 13 illustrates these concepts where progress risk maturity, reviewing process and continuous assessments all originate from the theoretical framework, whereas the last concept of focus on current risks originates from the empirical data.
5.3 Intra-project communication

This following section will analyze the empirical findings regarding intra-project communication by applying the corresponding theories found in the theoretical framework. The analyses in the three different areas purpose to create three models for how each respective area can be improved.

5.3.1 Improving information distribution

The empirical data from the interviews show a large use of meetings as the main tool to distribute information to the project team, which is also considered as one of the best tools for this purpose according to the theory by Yap, Abdul-Rahman & Chen (2017). However, Yap, Abdul-Rahman & Chen (2017) highlight that project meetings need to include appropriate company roles to allow for the appropriate knowledge to be available. The empirical evidence for included roles in project meetings is mixed, but as a whole, project managers invite people according to the topic being covered during that particular meeting. As an example, one interviewee includes a technical expertise group for project meetings which makes sure most technical questions can be answered during the meeting. According to the theory by Yap, Abdul-Rahman & Chen (2017), this would mean that meeting effectiveness is increased. While discussing the subject of meeting effectiveness, some interviewees were also satisfied with the effectiveness of their project meetings, although most considered the effectiveness low. Even though the meeting effectiveness was considered low, the empirical data show that these interviewees did not expect the effectiveness to be high as the purpose is merely to distribute information. This is however not in line with Yap, Abdul-Rahman & Chen’s (2017) model as it means all meetings should strive towards effectiveness, regardless of the purpose of the meeting. One interesting view was explained by one interviewee who considered effective meetings and innovative meetings to contradict each other. One reason not to focus on making meetings more effective is thus to preserve innovativeness and idea generation and this is something which is not identified by Yap, Abdul-Rahman & Chen (2017). However, every meeting has a distinct purpose and regular project meetings intended to distribute information, might not have to be innovative since there is perhaps no need for idea generation.

According to Nielsen (2009), meeting frequency is recommended to once per week during normal conditions. Empirical evidence show a meeting frequency of every other week for most projects which thus is too infrequent. Two interviewees who both utilize project meetings at a frequency of every other week also experience the meeting effectiveness to be low, which could be a result of too much information needed to be distributed. One of these interviewees also experience poor information absorption which could be a result of the same phenomenon. The other interviewee solves this by having daily stand-ups which naturally relieves some information every day. On the contrary, one interviewee who applies project meetings whenever necessary, experiences good meeting effectiveness.

In the case of project meetings, one interviewee elaborated that making all attendees absorb information is more important than effectiveness, which is also in line with the model by Nielsen (2009) where meetings is seen as a forced approach to communication. Some methods for improving information absorption are discussed by the interviewees, for example to send out the presentation slides beforehand or only meeting with smaller groups. Nielsen (2009) proposes a combination of forced and voluntary communication methods for distributing information and this is also realized by one interviewee who combines meetings with a project wiki. According to the empirical data project managers in general seem to only use a project board as the only tool for voluntary information. Since a physical board can
prove to be bothersome to access, some other means for voluntary communication are thus recommended.

The project board is a communication tool described by Meyer (1994) as useful and effective. As shown by the empirical data, most projects are using a project board as a tool to distribute information. One of the most important considerations according to Meyer (1994) is to include information which is important to the project, not using generic measurements. One interviewee in particular demonstrates how the project board includes the number one challenge, the time plan. No other indications were received on whether or not the measurements included are of particular importance to the project. However, some interviewees include the backlog on the board and it is updated whenever a task is completed in the backlog, which indicates that an important component is included on the board since the backlog most often is essential to the individual project. Two other interviewees also state that their boards are being updated frequently which is something Kawamoto & Mathers (2007) consider critical in succeeding with a project board.

The various concepts for improving information distribution covered above are visualized in Figure 14. Here, all concepts are results of the analysis of the empirical data by using the theoretical framework.
5.3.2 Improving sub-project integration

Sosa, Eppinger & Rowles’s (2004) recommended approach to allow for integration between several sub-projects is a shared document, which is the same approach several interviewees utilize for the same purpose. The document is supposed to include specific requirements between product interfaces according to Sosa, Eppinger & Rowles (2004). Especially the approach used by one interviewee resembles this theory by utilizing a shared excel-sheet containing technical details several sub-projects need to share. Another interviewee displayed the approach to use a time plan to illustrate team interactions throughout the project which also resembles the theory by Sosa, Eppinger & Rowles (2004).

The empirical data from the interviews show the most senior project manager finds it difficult to identify which sub-projects will require special integration at project start, but finds it easier as the project progresses. Sosa, Eppinger & Rowles (2004) suggest that learning from previous similar projects can simplify a scenario such as this, which indicates that perhaps not much have been learned from the previous project for this particular product. Conversely, a different interviewee stated that sub-project interactions are relatively easy to predict and this might suggest that more learning has occurred regarding this product. The same interviewee adds that experience is important to be able to predict interactions, which is in line with the theory by Sosa, Eppinger & Rowles (2004). The theory further proposes projects to analyze the product architecture for possible dependencies as an approach to plan for team interactions. This particular approach is not used by any interviewee and thus it is recommended as a method for improving sub-project integration, especially where product experience is lower.

Most interviewees consider co-location of project managers to be an effective approach in integrating the various sub-projects, especially as it allows for informal conversation without any burden. Dietrich’s (2006) model for project integration recognizes informal and autonomous meetings between project managers as an important integration mechanism, especially during high-uncertainty situations which might be the case with these kinds of development projects. Even though most sub-project managers are not co-located, most project teams are. One interviewee explains how his/her project team is co-located during most of the project, but at times project members instead are located according to the nature of the task. This is similar to the theory by Lakemond & Berggren (2006) where it is suggested that project teams should be co-located in the beginning and end of the project, but rather in the vicinity of experts during the project. The interviewee seems to recognize the benefit from locating each project member in such an environment which will assist in completing the assigned task. However, no other interviewee showed any awareness of such strategic co-location and it is unclear whether or not the single interviewee utilizing this co-location strategy is actually benefiting from the approach.

The model proposed by Dietrich (2006) to allow for project integration consists of (1) formal group mechanisms, (2) informal group mechanisms, (3) formal personal mechanisms, (4) informal personal mechanisms and (5) formal impersonal mechanisms. Starting by looking at the first mechanism, the empirical data show project managers utilizing meetings. According to one interviewee, this is the main approach to integration. From the second mechanism, it was shown that project managers co-located to one common office utilize this mechanism more than others. Both autonomous meetings and formalized meetings are used by co-located project managers, however no form of informal group mechanisms are identified from other project managers. A mechanism from the third category being used is a coordinator, which one interviewee explained as a specialized group with the purpose of facilitating integration. From the fourth mechanism, e-mails and face-to-face contacts are heavily used by project
managers, especially according to two interviewees who consider this approach to be simple and allows for better understanding. The documents and time plans used for sub-project integration purposes are examples of mechanisms belonging to the fifth category.

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<th>High uncertainty</th>
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<td>Informal personal</td>
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Figure 15: Changes in mechanism importance during high uncertainty (left) and for complex projects (right), inspired by Dietrich (2006).

Dietrich (2006) recommends a balance between these mechanisms during normal conditions. By looking at the used mechanisms described above, it becomes clear that most emphasis is on formal group mechanisms, such as meetings, and informal personal mechanisms, such as e-mails and conversation. Only one interviewee showed any evidence of utilizing mechanisms from the third category and only the co-located project managers displayed use of the second mechanism. In line with Dietrich’s (2006) model, more focus should thus be put into these two mechanisms to further improve sub-project integration. To increase the use of informal group mechanisms is also in line with the reasoning above, to co-locate sub-project managers.

Even though a balance is recommended during normal conditions, there are special cases for complex projects and for high-uncertainty situations, which is depicted in Figure 15. For high uncertainty, informal group mechanisms become more important together with formal personal mechanisms, further formal impersonal mechanisms and informal personal mechanisms become less important. Conversely for complex projects, formal group mechanisms along with formal impersonal mechanisms will be more prioritized and informal personal mechanisms is less prioritized.

The clear focus on formal group mechanisms from the interviewees would suggest that the projects are of a complex nature, which is in line with the reasoning regarding complex projects earlier in this thesis. The empirical data from the interviews also show formal impersonal mechanisms being utilized to an extent which also would suggest that the projects are of complex nature. However, according to the model by Dietrich (2006), informal personal mechanisms should be less prioritized for complex projects, which is not the case for the interviewed project managers who tend to rely readily on e-mails and face-to-face conversation. It was further highlighted during an interview that many development projects are uncertain since the end product is abstract during most of the project. Hence, for these uncertain projects, mechanisms for informal group and formal personal would develop a higher importance for integration, in line with the model by Dietrich (2006). Formal personal mechanisms are also used to some extent since a group for integration is utilized according to one interviewee. However, for high uncertainty, formal impersonal mechanisms are supposed to be less prioritized and this is not the case since most interviewees see the integration documents as a critical success factor to sub-project integration. Similarly to complex projects, informal personal mechanisms are also supposed to be down-prioritized and this is not happening either according to the empirical data. Although since the suggestions for high uncertainty only come from a minority of the interviewees, certain changes can be done for a project where the scenario seems to be of high uncertainty.
Figure 16 illustrates concepts for improving sub-project integration. Shared document and co-location originate from the above analysis with a foundation in the theoretical framework and meetings originates from the empirical data.

Figure 16: Concepts for improving sub-project integration.
5.3.3 Improving communication planning

The model for a communication plan proposed by Samáková et al. (2017) includes the four areas of environment, channel, cognitive and system. Looking at communication environment, which is the strategy and structure of communication, the empirical findings show this to some extent as the communication plan includes how meetings will be structured throughout the project. However, the plan does not include much information other than meetings which makes the plan weak in this area since no structure is provided for other forums such as the wiki or how e-mails will be sent out. For communication channel, the same result is found as for the previous area since the communication plan includes information on meetings but not on other important tools. In fact, the plan is strong in the sense of communication channel when considering only meetings as the meeting frequency is described. Continuing to the cognitive area, no information regarding this is written in any communication plan for any project. Since Saab Dynamics is operating in a global environment, the communication plan should, in line with the model by Samáková et al. (2017), consider cultural differences. Lastly, no information was able to be retrieved regarding any system for communication and thus no proper analysis can be done for this area other than a communication plan should include this aspect.

Continuing, Samáková et al. (2017) also cover the three basic factors of communication including who to communicate with, how to communicate and what to communicate. According to the empirical data, no information on either of these is included in the communication plan. Some interviewees state that this kind of information is figured out during the project but never documented, but as Nielsen (2009) states, it should be documented in the project plan to allow for better communication. Many interviewees further discuss the continuous factor of communication planning, to continuously write and update a plan for communication, which is something not mentioned by any of the scholars reviewed. Even though not supported by the theory, the interviewees who apply continuous planning by updating find it successful and might thus be an alternative for other projects.

Figure 17 illustrates concepts for improving communication planning. The first two concepts of four communication areas and three communication factors originate from the theoretical framework and continuous updating has its foundation in the empirical data.
Figure 17: Concepts for improving communication planning.
6 Discussion

In this chapter, the result of this study will be discussed and various recommendations for improving project risk management and intra-project communication will be given.

The planning phase of a project can be a challenge for new or sometimes even experienced project managers, there are many areas to consider and within each area there are a plethora of various methods to choose from and far from every method will benefit every project. Saab Dynamics is experiencing this issue as business is expanding and thus new project managers are employed at regular intervals. There are however experienced project managers who have developed solid methodologies for working with various project management practices, but on the other end of the scale the newer project managers find it difficult to find suitable methods. If learning could be applied to development projects newer project managers could learn from the more experienced project managers.

Learning in project-based organizations

The examined organization at Saab Dynamics displays many features of a project-based organization, although mainly the absence of real functions as expressed by the interviewed project managers. As a result of this, learning becomes suffering since there is no place in the organization for facilitating learning. Hence, to improve learning, the functions need to be strengthened which would imply an organizational redesign towards a project-led organization. An example of strengthening the functions is the assignment of the risk manager who strengthens the project management office which is considered a function. Since a risk manager was appointed, it can be a sign that projects are experiencing issues with various activities not specific to one project, such as learning or risk management, which are commonly managed by functions. These activities are similar in the sense of their benefit from being more centralized and less specialized for each project. Similarly to the role of the risk manager, the functions can further be strengthened by assigning learning activities to functions, meaning that it is the responsibility of each function to facilitate learning between projects. Project managers are displaying a wish for a database containing suitable and proven methodologies for working with various project management practices. The most logical location of this database would be outside of the projects since projects are temporary to their definition, thus the database would have to be located with a function. This wish further emphasizes the need for stronger functions which are able to manage activities not specific to a project. These issues of not having functions strong enough to manage suitable activities are also identified by Hobday (2000) as common for project-based organizations. Redesigning the organization and immensely strengthening functions is likely only possible by top management, which makes this possibility complicated. Although, smaller efforts to strengthen the functions might be to employ project coordination roles, like the risk manager, which is not as complicated but will still result in stronger functions and thus a bigger opportunity for inter-project learning.

One approach for facilitating learning between projects is by using post-project reviews. To allow for new projects to utilize the knowledge generated during the current project, the tacit knowledge need to be converted to explicit knowledge which will enable the knowledge to be shared. There are two dimensions for Saab Dynamics to consider in order to successfully convert gathered knowledge into usable information. First, each project needs to have ample time budgeted to perform a post-project review, otherwise the review will not be of high enough quality and will thus not be utilized in upcoming projects which will result in large quantities of knowledge going to waste. Second, the reviews need to be structured in a way which allows for the tacit knowledge to successfully and accurately be converted into explicit knowledge. Factors to consider here are to document thoroughly, to let experienced project
members tell stories about experiences gathered throughout the project and to gather opinions from the entire project team. If this stage can be completed with success, then the post-project reviews will be able to assist upcoming projects as a result of the concrete properties of explicit knowledge. Other than post-project reviews, projects at Saab Dynamics are urged to utilize continuous improvement as another factor for learning. Although this factor is mainly purposing to improving practices of the ongoing project and not so much for other projects. However, this continuous approach can also be used to document learnings during the project and thus not having to wait until the finish to document everything. This can also be beneficial as it reduces the risk for learnings to be forgotten before they are documented.

**Project risk management**

The concept of how learning from previous projects can improve project management practices is in this study further applied to project risk management and intra-project communication. This is accomplished by examining individual learnings collected through interviews with five project managers. For project risk management, the main issue was identified as the continuous approach to risk management, namely risk monitoring. To start, risk maturity is perhaps the most determining factor of how well a firm can practice risk monitoring and it is recognized that phase 4 in the risk maturity model is required to be able to practice risk monitoring. Given that there is a structured approach to risk management, risks are analyzed and education is provided for enhancing the knowledge regarding risks, the identified risk maturity level for this case is phase 3, defined. There is however some evidence pointing to phase 3 not being achieved, such as questioning of how structured the process actually is and whether or not the organization is in fact proving education. Following the above analysis though, phase 3 can be considered as achieved, but these unclear questions can be seen as areas where further work is needed, which is to be combined with the work needed to reach phase 4. By not seeking to improve the structure of the risk management process and not improve education, there is a reduced chance of reaching phase 4 as the foundation will not be as solid.

There are two critical factors which need to be considered to progress to the managed phase in risk maturity, where the first one is to involve key internal and external stakeholders in the risk management process. Internally, it is essential that not just the level of project management is managing risks, but this also needs to be at the program level and even one more step up the hierarchy to division management. To have all these parts involved in the management of risks will make sure risks are prioritized according to what is important in the eye of top management and that the risk management process is more in line with the corporate strategy. External to the firm, key customers and suppliers should also be involved in the risk management process. One reason for this is that they can provide critical knowledge valuable to risk management, for example suppliers might be experts on the technology they deliver which enables them to effectively identify and analyze risks regarding technology. There are potentially obstacles for involving suppliers in the project as a result of security classification, but this should however be possible to work around by just involving them in risks directly regarding their deliveries.

The second factor to consider for progressing to phase 4 is risk culture. A risk culture is built by the artifacts which are communicated as espoused values and translated into basic assumptions. In the case of Saab Dynamics, project managers are not certain what the set structure is for managing risks, which proposes a weakness in either artifacts or espoused values. It is however identified that there is a structure for managing risks according to GMS which also some interviewees agree on, which isolates the problem to espoused values. An approach to enhance espoused values is to appoint a risk manager who can communicate the artifacts. Since a risk manager was appointed recently, and given that a functioning espoused
values would allow for a risk culture to grow, Saab Dynamics is currently progressing into phase 4 of risk maturity, however there are some additional factors to note here. First, the risk manager needs to be able to communicate the essence of the artifacts, in other words the risk manager needs to reflect what top management considers important. Second, the risk manager is currently assigned to one single project which makes the majority of projects still without any guidance. Hence, to be able to develop a risk culture in terms of these concepts, the risk manager will need additional education on how risks are supposed to be managed according to top management and there should be a risk manager available for most projects, which might result in a need to appoint or hire yet another risk manager. Even though a risk manager is a valuable asset to projects, there should however be other dimensions of espoused values which communicate the artifacts. A relevant dimension for this case would be to improve the structures and processes in GMS since these currently are too abstract to apply to individual projects. Improving GMS would be a major task since it defines processes for the entire organization, but the reward would also be high and in form of an enabled risk culture.

These two factors will enable Saab Dynamics to progress to the managed phase of risk maturity, which further means that projects are able to monitor risks. There are however some specific concepts for how to carry out the risk monitoring practically, the concepts discussed here are a mixture of theories and what is done in successful projects already. The first concept recommended to utilize is risk reviewing, where expected losses, avoided risks and mitigated impacts are reviewed continuously during the project. The purpose of this is to improve the risk management process as the project progresses and to motivate the project team to focus on risk work. By doing this, the risk process can also be presented with ease to various stakeholders such as top management which can allow them to see what is working and what issues there are. This concept would be combined with a second concept of continuous assessments where new risks are identified and risks are reevaluated according to the framework for risk analysis. The idea behind this concept is to constantly have a relevant list of risks which all have been recently prioritized which makes it easier to know what risks to focus on currently. These concepts should be utilized for a project meeting or workshop which would occur at set points during the entire project. The more often these workshops can be held, the better the continuous risk management process would be and less information would have to be managed during each workshop, recommended frequency is once every month.

**Intra-project communication**

Continuing over to the second application area of learning from previous projects, intra-project communication, three distinct components have been identified as key areas for improving intra-project communication. The first component is information distribution which refers to how the project manager distributes information to the entire project team. The analysis for this area found a balance between forced and voluntary communication to be the best overall strategy for distributing information. Forced communication includes meetings which is a suitable method for information distribution but at the same time can be ineffective. To increase meeting effectiveness three factors need to be considered. First, for a meeting to be able to solve problems and manage information correctly, relevant people need to attend the meeting, which means that experts in the topic being covered during the meeting have to be present. For many regular project meetings the experts might be found in the project team and thus no external experts are needed, but for meetings with specific topics where the focus is to solve problems specific experts have to be present.

Second, the meeting frequency is recommended to once per week or whenever considered necessary, although not more infrequent than once per week. The purpose of this approach is to have less topics and issues to manage for each meeting, which will increase the
effectiveness of the meeting. Another result of this frequency might be that the project team has more regular opportunities to discuss identified problems which would otherwise have to wait for longer and thus increase the risk for the problem to grow.

Third, it might be an idea to keep the number of people attending meetings to a minimum since smaller groups often increase effectiveness. Especially for those problem solving meetings, a smaller group would increase participation among the people attending. Even though many meetings can be effective, there are still many people who tend to not absorb as much information as desired and this is where the concept of forced and voluntary communication comes in. A meeting will force information on the attendees and some people respond negatively to this approach. Instead, projects should also utilize sources of voluntary communication to distribute information, such as a project wiki or e-mails. Having a project wiki containing all relevant information will result in project members being able to easily access the information whenever needed. By focusing on improving voluntary communication to be used as much as meetings, most people’s preferred mode for communication (forced or voluntary) will be satisfied which will improve information absorption among the project team. Another tool for voluntary communication is the project board which needs to be positioned to allow for easy access, otherwise the dimension of voluntary communication is questioned. The number one success factor of the project board is to include critical information for the specific project. All projects might have similar factors which are all important such as budget, risks or time plan, but each individual project also have specific critical factors which affect the project more than usual. It is thus recommended to start by analyzing the project to identify these critical factors which will have an increased impact on the outcome of the project. Moreover, the project board needs to be regularly updated since old information usually is not as relevant. This update also includes identification of new critical factors which might have to be included on the board.

The second distinct component for improving intra-project communication is sub-project integration. This component is vital for larger projects containing sub-projects responsible for a specific part of the product since all parts need to function together in the end. Five mechanisms for project integration are formal group, informal group, formal personal, informal personal and formal impersonal. These mechanisms require balance normally, but during complex projects or for a high-uncertainty situation some become more important. Currently, development projects at Saab Dynamics heavily rely on formal group mechanisms (meetings) and informal personal mechanisms (e-mails and conversation), with some inclusion of formal impersonal mechanisms (shared documents). For common projects, the recommendation is thus to focus on improving the two lacking mechanisms, which for informal group mechanisms would mean co-locating sub-project managers and for formal personal mechanisms to utilize coordinators external to the project to improve integration. Many projects carried out are of complex nature and thus comes with special recommendation in terms of integration mechanisms. These projects should rely on formal group mechanisms and formal impersonal mechanisms, with a reduced usage of informal personal mechanisms. Meetings between sub-project managers become more important and so do shared documents containing sub-project dependencies. These shared documents need to include various dependencies which two or more sub-projects need to be aware of, such as a technical interface which two parts will have to share.

An approach which can create this kind of document is to analyze the project and product architecture for interactions. Especially for large complex projects, possible interfaces where different sub-projects might have to interact need to be identified early to allow for ample integration. This identification process will be substantially easier with experience from similar projects, otherwise common sense in combination with technical experts can be
utilized to identify interactions. The interactions can then be documented and used as a shared document which several sub-projects can modify with certain technical constraints. If the project contains several uncertainties, which might often be the case for new development projects, other mechanisms become more important. Here, informal group mechanisms and formal personal mechanisms become critical and formal impersonal mechanisms and informal personal mechanisms become less important. Co-locating the sub-project managers allows for more autonomous face-to-face contacts which can be useful during high uncertainty. Even though the sub-project managers might have their respective offices relatively close to each other, being in the same office allows for that much more spontaneous communication to occur which will improve sub-project integration. Moreover, co-location of project teams will also provide improved integration, although inside each sub-project team. In general, the recommendation is to have each project team co-located since this will allow informal communication to occur, but during technically intense periods it might be beneficial to have each project member located in his/her home division. In the home division, there are usually plenty of experts in the area the task concerns which might assist in completing the task.

Communication planning is the third component for improving intra-project communication. There are again some important concepts to consider when planning the project communication. First, the communication plan should contain information regarding environment, channel, cognitive and system. Communication environment further contains the strategy and structure of all communication, such as how the communication will facilitate information distribution and sub-project integration. Under channel, the communication plan will contain what tools will be used and how, such as when meetings will be held. Then for cognitive, there should be some information on how the communication will be managed differently across the globe, which is critical for a global actor such as Saab Dynamics. Lastly, system will explain how all these factors will function together in practice. Second, the plan should also contain who to communicate with and what will have to be communicated. This communication plan will have to be updated during the project since many factors tend to change.
7 Conclusion

In this chapter, the two research questions will be answered using the result from this thesis.

For Saab Dynamics to be able to successfully execute projects, project management practices need to steadily evolve as competitors and external regulators increase the demands on the developed products. For newly appointed project managers, these practices are unclear which during the planning phase creates plenty of uncertainties when the project managers are choosing methods. By instead learning from previous projects, especially during the planning phase, proven practices can be used which can enhance project execution.

Learning from previous projects is a complex task which requires involvement of functions, not just projects. To allow for inter-project learning, the functions need to be strengthened to a point where they can facilitate learning activities, which is a general approach other project-based organizations can benefit from as well. The learning activity identified as most critical is post-project review which requires ample time is budgeted and planned for. The post-project reviews are to be structured in such a way that every thought is documented, everyone gets the chance to express opinions and the project team is urged to use stories to describe learnings.

**RQ1: How can continuous risk management in development projects at Saab Dynamics be improved by applying learnings from previous projects?**

First, there is a process to consider in order for continuous risk management to be viable. Saab Dynamics needs to mature in risk management by involving key internal (program and top management) and external (suppliers and customers) stakeholders in the risk management process and by building a risk culture. Involving key stakeholders in the process will increase the knowledge base behind the decisions which will improve the process. For a risk culture to grow there is a need for a risk manager to be available to all projects and the risk managers need to be able to communicate the set process for risk management. This implies that new risk managers might have to be appointed and also educated in the set process. The risk related information in GMS will also need a rework or be complemented to make sure the set process for managing risks is accurately described. Second, various concepts are recommended to be utilized during projects to practically carry out continuous risk management. Once every month, a Reviewing and Assessment Workshop should be held for each project where the project manager guides the project team through how the expected losses have changed and what risks have been avoided or successfully mitigated. Further, the project team should during these workshops reassess the risk landscape by identifying new risks, deleting non-relevant risks and updating probabilities and impacts.

**RQ2: How can intra-project communication in development projects at Saab Dynamics be improved by applying learnings from previous projects?**

Three areas of communication were identified as key to improving intra-project communication. First, information distribution can be improved by balancing meetings with voluntary sources of communication such as a project wiki or project boards. Project meetings should be held every week and people relevant for the meeting topic should be included. A project board containing project-critical information is recommended for all projects since it improves intra-project communication substantially. Second, sub-project integration can be improved by increasing effort on informal group mechanisms, especially for highly uncertain projects, which can be accomplished by co-locating sub-project managers. Although for complex projects, effort should be put into regular meetings and having shared documents between sub-projects where each sub-project can add various technical dependencies. These documents can be created by analyzing the product architecture and utilizing experience.
Third, communication planning can be improved by writing a communication plan for every project where a strategy for communication is included along with what tools will be used and how the communication will manage cultural differences. It should further be described how these factors work as a system. As this describes how communication will be carried out, there also needs to be a description on what to communicate and with whom. The communication plan is a live document which requires regular updates.

Continuous risk management and intra-project communication are common problem areas for organizations today. The conclusions discussed above can therefore to some extent be useful to other firms seeking to improve these project management practices, even though the concepts for improving each practice are tailored to development projects at Saab Dynamics.
8 References


Appendix 1: Interview guide

Bakgrund
- Ålder:
- Utbildningsbakgrund:
- Hur länge har du arbetat som projektledare i din karriär?
- Hur länge har du arbetat som projektledare på Saab Dynamics?

Lärande i planering (5 min)
- Från din erfarenhet på Saab Dynamics, hur mycket tid läggs i genomsnitt på att utvärdera projekt?
  - Vad anser du att det leder till?
  - Hur struktureras utvärderingen?
  - Hur arbetar ni med dokumentering?
  - Hur mycket tid skulle behövas för att lära sig från projekt till projekt?
- Vilka lärdomar tar du med dig från tidigare projekt?

Riskhantering (25 min)
- Vad väger tyngst i den här matrisorganisationen, projekt eller linje?
- Vad ser du för styrkor/svagheter med den nuvarande riskhanteringen?

Riskmognad
- Vilka områden (identifiering, analys, mitigering, monitorering) är ni starka/svaga i?
- Upplever du att det finns en etablerad process för riskhantering som genomsyrar hela organisationen (utvecklingsavdelningen)?
  - Hur arbetar organisationen för att stärka kunnande och medvetenhet om risk?
- Vilka mätt används för att mäta och värdera risker?
- Involveras personer utanför projektet i riskhanteringsprocessen? Vilka?
- Sker något arbetet med att kontinuerligt förbättra processen, i så fall hur sker det?

Riskkultur
- Hur upplever du ledningens attityd angående risk?
  - Hur bär sig ledningen åt för att kommunicera hur ni ska hantera risk?
- Vilken attityd har dina projektmedlemmar angående risk?
  - År det naturligt att tänka risk?
  - Finns det en vilja att hantera saker på sitt sätt?

Riskmonitorering
- Hur arbetar du för att hantera risker kontinuerligt under projektets gång?
  - Uppdatera
  - Omvärdera
  - Utvärdera
Kommunikation inom projekt (25 min)

Informationsspridning

- Hur arbetar du med att sprida information i ditt projekt?
  - Verktyg
- Hur upplever du effektiviteten på dina projektmöten?
  - Vilka närvarar
  - Hur ofta? Finns undantag?
  - Upplever du att alla kan ta åt sig information?
- Används någon form utav projekttavla för att visualisera information?
  - Vad består tavlan av för information?
  - Varför just den informationen?
  - Vart är tavlan placerad?
  - Uppdateras tavlan? Ny information?

Integrering

- Hur sker kommunikation mellan projektmedlemmar, formellt och informellt?
  - Möten, elektronik, dokument
- Till vilken grad är projektmedlemmar samlokalisera?
  - Görs det ändringar?
- Endast för projekt innehållande delprojekt: Är det klart vid projektstart mellan vilka delprojekt som det kommer att krävas extra kommunicering?
  - Hur kommer man fram till det?

Kommunikationsplanering

- Hur arbetar ni med kommunikationsplanering?
  - Skrivs en kommunikationsplan som säger hur kommunikation ska ske?
  - Vilken sorts kommunikation ingår i den?
  - Olika för olika intressenter?

Övrigt

- Om du hade all makt på företaget, hur skulle du förändra de processer vi diskuterat?