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Project-to-Project Learning in New Product Development Organization

Master of Science Thesis in the Master Degree Program, International Project Management

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Abstract

The aim of this study is to analyse the project – to – project learning in the given organisation and try to find ways to improve it. The method used in the study is a qualitative research method. The research was based on secondary data from projects and semi-structured interviews to find themes and issues with project-to-project learning in the organisation. The result show that official process for knowledge transfer between projects is not working as intended. The process doesn't fulfil basic characteristic for PPRs. Concluding the study the research shows that the organisation has misjudged the effort needed to transfer the type of knowledge required for project –to –project learning. The problems with the process can be corrected but for this to happened the upper management must get involved and prioritise process management and organisational learning for long-term sustainability.

Key words: Project learning, organisational learning**,** knowledge transfer, knowledge barriers and project management.

Sammanfattning

Avsikten med denna studien är att analysera projekt – till – projekt lärande i den givna organisationen och hitta sätta att förbättra processen. Metoden som används är en kvalitativ forsknings metod där projekt lärande processen analyseras. Forskningen var baserad på secondär data från projekt dokumentationen och intervjuer med projektmedlemarna. Resultaten av forskningen visar att lärande processen mellan projekten inte fungerar som den var tänkt. Processen uppfyller inte bas kriterier på hur ett PPR system skall vara utformat. Slutsatsen av studien pekar på att organisationen har missupfattat hur mycket det krävs för att ha ett fungerande arbetsätt för att överför kunskap mellan projekten Detta problem kan lösas men endast med aktivt deltagande från högsta ledningen för att ge prioritering åt process ledning och organisatoriskt lärande för att åtstadkomma långsiktig hållbarutveckling.

Preface

This report details the efforts and results of a master thesis conducted at a major automotive company in alliance with the Department of Civil and Environmental Engineering in the Master Degree Program, International Project Management at Chalmers University of Technology both located in Gothenburg, Sweden.

The aim with the thesis was to analyse the complex learning process between projects in a new product development organisation. The author's great interest in knowledge management especially in project orientated organisation has led to this investigation. This study is aimed to analyse project – to – project learning in the given organisation with the attempt to find ways to improve it. Also the author's interest and knowledge in organisational learning and management was further developed as the research was conducted.

The author wants to give his greatest gratitude to the interview participants from the projects team at the new product development section. The author wants also to give special appreciation to Dr. Petra Bosch-Sijtsema for all her help and guidance during this assignment.

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List of abbreviations

PPR	Post Project Review
SPM	Senior Project Manager
PM	Project Manager
PL	Project Leader
GPP	Global Project Process
NPD	New Product Development

Contents

1. Introduction

1.1 Project – to – Project Learning in New Product Development

"The need for organisations generally to be 'learning organisations'' is rightly emphasised, and the need to manage project well, and to learn from one project to the next, is clearly of particular importance to business." (Williams, 2003:443) Projects are created to meet changing business needs making them central to organisational performance (Boddy 2002). However, the completion of the project is the main driving factor. Once the project is delivered the project teams tend to break up and move on leading to a frequent reinventing-of-the-wheel, with every start of a new project. Lack of project – to – project learning is the root cause of mistakes, re-doing work, low quality and productivity (Knauseder, 2007) which can all be associated with organisational underperformance. So, how can lessons learned in one project be transferred to next project?

The ambition of this study is to outline the processes for project – to – project learning that are present in the given company and see how they can be improved. The study will also contribute to the theoretical framework that could be applied to other companies with similar situation. The case study will be conducted in a company which is one of the largest manufacturers of heavy duty transport solutions such as trucks, buses and construction equipment. The company has sales' and service organisations in 140 countries and assembly factories in nine different locations spread worldwide that deliver products to different markets. To develop leading transport solutions for its customers the company utilises product development projects.

Every project is unique. Projects are set of activities run in one specific time frame, by unique set of people in a unique set of contexts. However, even though they are unique, projects have attributes that they all share making them similar in practice. They need to meet performance expectations. They also involve and rely on people for success and they are context dependent. All projects are a balance or a trade-off between time, cost and quality constrains (Boddy 2002). During projects, learning is possible on individual, group and organisational level. However even though the term learning can be applied on individual and organisations the

organisational learning process is fundamentally different from individual. (Kim, 1993) In organisations *"Learning involves close interaction of order and chaos"*(Wenger, 1998:229). Projects are very potent to create an environment with a mixture of order and chaos. They are described as set of activities that are used to change something or create novelty, distinctive from day – to – day activities. With change the level of ambiguity rises that can be experienced as chaos (Boddy 2002). This makes projects perfect vehicles for knowledge creation and learning (Knauseder, 2007). Although there is a possibility to learn from projects, failing to learn from them is common. It might feel simple and intuitive to learn from past experience in projects and use that knowledge in subsequent projects but many studies show that there are a lot of obstacles that need to be overcome to make a working knowledge transfer process efficient between projects. M. Elmiquist (2007) discusses the lack of knowledge transfer between a New Product Development (NPD) project and organisation leading to failure of organisational learning. Schleimer et al. (2009), discusses the knowledge transfer between similar highly anatomy's units in the company. The problem identified in both articles is the challenging task of making lesson learned in one project or unit to be transferred and applied in an organisation or another project or unit. Ottosson (2009:88) states *"a well – known problem not much discussed is how to transfer the gained knowledge and wisdom from one project to another and to coming projects."* Goffin et al (2011) argues that *"...surprisingly, neither typical "lessons learned" that emerge from PPRs nor the role of tacit knowledge in NPD learning have previously been studied."* So project to project learning is recognised as a common problem in NPD organisations but there is little studies done on the subject.

Project – to – project learning has been recognised as significant to NPD organisations (Lynn, 1997, Goffin et al. 2011). To learn from projects lessons learned must be transferred and applied from one project to the next. Transfer of knowledge could be done by either transferring data or persons between projects (Goffin et al. 2011). Knowledge transfer is often referred to as the most important, yet most challenging knowledge activity due to the high complexity it possesses. Organisation struggle to gain and transfer relevant knowledge to and from other units in an effective and efficient way. Managing knowledge and its organisation-wide transfer are important to create and sustain competitive advantage (Scheimer and Riege, 2009). Even though much knowledge is created in any development project, the challenge to create value more then on individual level, the knowledge has to be absorbed and used in the organisation (Ottosson, 2009; Knauseder, 2007). Only knowledge production does not

necessarily guarantee that organisational learning will take place (Elmquist, 2007). Continues improvement as a way of working in research and development organisations is strongly linked to organisations capability to learn. By learning the organisation find new ways to solve problems and avoid repetition of past deviations from wanted outcomes (Michael and Palandjian, 2004;Goffin et al. 2011). Thus learning form projects is fundamental for NPD organisations to be efficient and sustainable. Carlile et. al. (2002:1180) states *"As the scale and scope of the integration task increases perhaps as result of product complexity, technological advance, or the difficulty of the regulatory environment – a firm's effectiveness in knowledge integration will distinguish it from its competitors"*.

2. Research Problem

It is argued that by having a learning organisation the chance of survival as a company is better. Sceptics to the learning organisation highlight the intangibility of knowledge management, which makes it hard to measure and to claim that it happens. Also questions about the effectiveness of learning and drawing conclusions from past experience when facing changed environment or novelty are raised. Learning traps such as ending up in a exploiting or exploring down spiral will not guarantee the survival of a company are brought up as concerns. Furthermore the time it takes from resources to draw lessons and store them that might be of no use as it becomes irrelative due to outer or inner circumstances change. However, even with these flows in the mechanisms, the intangibility, the risks and the cost associated with knowledge management, the price of repeating the same mistake that will threaten the survival of the company on open markets, must be a lesser choice of the two. The given company has a knowledge transfer process, but what are the weaknesses in respect to literature? How can the complex knowledge from one project be transferred to line organisation and then put in use for the next project? Every project has it specific surroundings with outer and inner challenges and opportunities so will the novel experience from one project be applicable to the next? Can organisations learn from projects because projects have a start and an end date? The literature about knowledge management highlights the problems with knowledge management. There are extensive research done on knowledge transfer between communities of practice and inter-organisational knowledge transfer but can lessons learned in projects be useful for organisations and enhance the project success in upcoming projects? Goffin et al (2011) states that "(...) *surprisingly, neither typical "lessons learned" that emerge from PPRs nor the role of tacit knowledge in NPD learning have*

previously been studied." Even though Goffin (2011) investigates the lessons that individuals learn from NPD compared to the learning that emerges from PPRs reviews this is highly relevant in this study is well because there is a gap in research on the mechanisms for NPD learning from projects.

2.1 Research questions

The aim of this study is to understand the complex phenomenon of project-to-project learning, if it takes place, how and why in the given organisation. To comprehend these following questions will be researched in the organisation:

- *How can projects share knowledge with line organisations and other projects?*

- *In the given organisations, what type of processes are present to share knowledge between projects, how are they used, what type of knowledge is shared and is it relevant for project-to-project learning?*

- *Are unwanted project outcomes repeatedly documented, why and how can they be avoided?*

3. Theoretical Framework

3.1 New Product Development Projects (NDP)

A NPD organisation is highly innovative environment. When innovation happens new knowledge is created. The ability to manage knowledge is essential for NPD organisation to sustain competitive and competent (Goffin et al. 2011). NPD Projects are commonly used to change existing products or invent new. A good way to describe a NPD project is to picture a firemen's trap used in the early twentieth century. The firemen's trap were used to catch an individual jumping from a burning building and had to have three things to be effective. They must be designed in strong material and allow each firemen easily to hold it and use it. Secondly, it needs to be held by several firemen at the same time pulling in different directions as hard as they can to safely break the fall of the individual jumping. Finally the firemen needed constantly look up at and adjust accordingly to ensure that the individual lands in the middle of the trap (Carlile 2004). The firemen are in this sentence different organisational functions holding to their own interest pulling as hard as they can, e.g.

purchasing, manufacturing, engineering, aftermarket amongst others, the strong material is the project organisation holding them together, and the project delivery is the falling individual that needs to be captured in the middle by making the trade-offs between the functions. This can be an imaginative mental picture of a NPD project.

"*All innovation and New Product Development (NPD) activities are learning processes for both team members and the collective in which they are part in*" (Ottosson, 2009:88). As projects are defined as set of activities (Boddy 2002), they will create knowledge when being run in organisations. However, as projects are set of activities in a given constrains of cost, time and quality, it can be argued that all projects are one of a kind. This is a common argument to avoid learning form projects and using that experience to enhance project management processes. Continues learning and improvement are the highest level of Project Management maturity. Failing to capture lessons learned will swiftly turn the mature to an immature project management organisation as mistakes will be repeated. (Williams, 2003) Carlile, (2005:555) argues *most innovation happens at the boundaries between disciplines or specialisations (…) working across boundaries is key ingredient of competitive advantage*" Projects are defined as collectives (Knauseder 2007) influenced by firms, other collectives and individuals. Collectives based on professions consist of individuals from same or different firms in same or similar professions. NPD projects differ in that way from collectives based on professions as they are a collective based on mixture of different professions to get a cross-functional team. This is because the mutual knowledge between two or more people that are familiar with each other will be greater then the sum of their individual knowledge (Ottosson 2009). By communicating individuals can create collective knowledge that is greater than the sum of individuals knowledge and thus NPD projects are run with multi disciplinarians professions to create a better solution than what would be possible by just added up the individuals knowledge. When NPD projects are being run in an organisation they create new knowledge that needs to be managed by the organisation. The knowledge transfer in product development environment is seen as more challenging then in repetitive process such as production due to context-specific knowledge creation in projects. Linkages between cause and affect are hard to define and the application of lessons learned that are applied far from the place they emerged (Elmquist; 2007). Or as made known by Williams (2003) *"One of the great challenges is the largely untapped opportunity for transforming our projects performance. We have yet to discern how to systematically extract and disseminate management lessons as we move from project to project."*

3.2 Getting the knowledge across

Learning organisation can be defined as ideas and knowledge generated and shared by individuals in an organisation across boundaries of space, time and hierarchy (Yeung et al. 1999:28; Knauseder 2007). The presence of boundaries between knowledge specific domains, organisation and project limits the information flow that leads to decline in communication (Knauseder, 2007). With decline in communication the chance for sharing lessons learned also decreases. Boundaries exist between professions or knowledge specific domains, communities of practice as well as between projects and projects and organisation. Two subsequent projects can be viewed as collectives or knowledge specific domains (Knauseder, 2007; Carlile, 2004). They will have two boundaries to overcome to share knowledge. One boundary is between the project and the organisation and the other one is between project and the next project. The transfer of knowledge will somewhat differ between subsequent projects and parallel or simultaneously running projects. Knowledge sharing between parallel or simultaneously running projects can be shared by formal meetings or forums to discuss topics of interest. The knowledge is shared between project members by sharing their experiences. The subsequent knowledge sharing process can also happen via forums and meetings but the documentation and the storage of documentation is vital for the process. Subsequent project have to learn from projects that have ended and the people working in the ended projects might not be there to share their experience or they do not recall what happened. This in turn makes it harder to transfer knowledge. The most common way is to use some sort of documentation to pass on the lessons learned. These documents are later used to learn from past experience and reuse it. The storage and the retrieval process play an important role on how the knowledge will be shared. Also the absorptive capacity of the organisation will influence the knowledge transfer. The different boundaries are illustrated in figure 2 showing how knowledge from one project to subsequent project could be transferred.

If organisations can recognise and learn from short coming and success from a previous project there is a greater chance that the project will not do the same mistakes and thus greater chance to succeed (Ottosson 2009). However as stated by Williams (2003:443) *"Business seems particular week on learning from projects, rarely exploring the reason for success or failure and rarely adapting management behaviour in the light of these lessons."* The ideal learning organisations need to have feedback loops back to their processes to sustain learning. (Hughes et al. 1996;Caffyn, 1997;Michael, 2004;Goffin et al. 2011). Carlile 2004's

framework describes the different type of boundaries and the processes for sharing knowledge across boundaries in table 1.

Syntactic boundary: A transfer or Information-processing approach	Semantic boundary: A translation or interpretive approach	Pragmatic boundary: A transformation or political approach
Circumstances		
Differences and dependencies Between actors are known. A common lexicon developed that is sufficient to share and assess knowledge at a boundary	Novelty generates some differences and dependencies that are unclear - different interpretations exist. Common meaning are developed and provide an adequate means of sharing and assessing knowledge at a boundary	Novelty generates some difference interests between actors that impede their ability to share and assess knowledge. Common interests are developed and provide an adequate means of sharing and assessing knowledge at a boundary
Solutions		
Theory: Information processing (Shannon and Wear 1949, Lawrence and Lorsch 1967) – transferring knowledge	Theory: Learning (i.e., communities of practice) – creating shared meanings (Dougherty 1992, Nonaka 1994) translaring knowledge	Theory: "Creative abrasion" (Leonart – Barton 1992) – negotiating practice (Brown and Duguid 2001) transforming knowledge
Techniques: Synthetic capacity, taxonomies, storage and retrieval technologies	Techniques: semantic capacey, cross-functional interaction/team boundary spanner/translator	Techniques: Pragamtic capacity, prototyping and other kinds of boundary objects that can be jointly transformed
Challenges		
Increase capacity to process more Information (Galbraith 1973)	Making tacit knowledge explixit (Polanyi 1966, Nonaka 1994)	Changing knowledge that is "at stake" (Bourdieu and Wacquant 1992, Carlile 2002)
A common lexicon is necessary but not always sufficient to share and asses knowledge across a boundary	To create common meaning to share and assess knowledge often requires creating new agreements	To create common interest to share and assess knowledge requires significant practical and political effort

Table 1. Comparative Summary of Approaches to Sharing and Assessing Knowledge Across Boundaries

Source: Transferring, Translating and Transforming: An Integrative Framework for Managing Knowledge Across Boundaries by Paul R. Carlile, 2004

Knowledge transfer is the most common and least complex way of sharing knowledge across boundaries (Winter 1987, Sulanski 1996, Argot 1999, Carlile 2004). With transfer of knowledge, the sender and receiver are adequately defined. By having well defined and stable differences and dependencies the knowledge transformation can be made effective and effortless. This situation gives way for actors to develop a common language and common or shared knowledge. The common knowledge functions as a boundary object, which the actors use to communicate across domains. Depending on what type of boundary is present between two collectives, actors involved will require different boundary objects to transfer the knowledge. If the boundary is a syntactic the knowledge can be easily transferred by numbers, specifications etc. If the boundary is semantic or pragmatic different type of boundary objects are needed often leading to adjustment of common knowledge and language. These types of boundaries are often underestimated leading to knowledge not being fully transferred (Carlile 2004). Usually in NPD projects the knowledge created is novel and can be domain specific. Novelty changes dependencies and differences between relations making the common knowledge at boundary between actors limited. When novelty is present both the capacity of the common knowledge to represent the differences and dependencies now of consequence and the ability of the actors involved to use it become important issues (Carlile, 2004). This can require adjustments of the common knowledge and language as they become insufficient to represent knowledge across the boundaries. However, this is not commonly known and it is easily underestimated the effort needed to change and adjust these stable conditions (Carlile, 2004). If the common knowledge and language is not adjusted the knowledge transfer will suffer. To have a common knowledge the meaning between the knowledge specific domains or collectives as with the case with a project and the organisation or functions in organisation need to re-define a common knowledge and common language by adjusting the processes and management accordingly to lessons learned from projects.

3.3 Factors influencing knowledge sharing

The characteristics of the knowledge will have impact on the way knowledge is transferred, if it is transferred, and, the cost associated with the transfer. Even though there are undoubtedly benefits to learn from others, the learning will depend on complexity, usability and adaptation of the acquired knowledge. Thus its characteristics will influence the knowledge transfer

(Schleimer and Reige 2009). The more context-specific the knowledge of the subsidiary, the more time consuming ant costly it is for the subsidiary to transform and transfer this knowledge into organisation-wide understandable context (Schleimer and Reige, 2009). This is because more effort is needed to redefine the common knowledge and language between actors and the differences and dependencies due to novelty of the knowledge. If the knowledge is not perceived as relevant and/or applicable to recipient it is not shared (Scheimer and Riege 2009). To create value for the organization, the generated knowledge must be relevant for the future development projects otherwise it is just money down the drain (Elmquist 2007). The case study by Elmiquist (2007) was made on a very unique project. The knowledge created was based on value and norms and not on improvement to technical features. This had little impact internally in NPD organisation because according to interviews, the only thing that makes it through are technical solutions (Elmquist 2007).

The project created knowledge but when it came to transferring it to organisation the evidence was less convincing. Knowledge created by the project was of different character and not necessarily directly linked to the product itself. Much of it was related to values and norms. In the article by Scheimer and Riege, (2009) they conclude that the knowledge created on local markets is seen as market and context-specific that it is not feasible to transfer it to another unit relative to the time and cost it would take. The knowledge that is wanted to be transferred must be relevant and applicable. Carlile (2004) identifies three factors that will influence knowledge sharing at a boundary: *difference, dependency*, and *novelty*. Difference in this context is the difference between the depth of knowledge e.g. knowledge difference between a novice and an expert, dependency, being a mutual reliance between actors to reach their goals and novelty, which can be viewed as new knowledge due to e.g. new customer demands.

Without dependency, the difference in knowledge is of no significance (Carlile 2004). Dependency can be viewed as a *relational specific factor* (Scheimer and Riege 2009) that is mainly a relationship between the sender and the receiver of the knowledge. Different units need to perceive others knowledge as credible and useful in order to be willing to collaborate with one another. Trust is closely linked to credibility and regarded as one of the most important factors of knowledge transfer between units. (Scheimer and Riege 2009) Visualisation of dependencies and relations in complex environments such as NPD is one of the biggest challenges. By visualizing the dependencies, the different knowledge domains will see the benefit of sharing knowledge, they will learn to trust each other, and by doing so the

transfer of knowledge can be done more effectively as they create common knowledge and language at the boundaries. Also, the transfer depends largely on the subsidiary's *absorptive capacity,* a firm's or individuals' ability *"to recognise the value of the new, external knowledge, assimilate in and apply it to commercial ends"* (Cohen and Levinthal 1990:128). A number of studies have identified that the role of absorptive capacity as the most significant determinant of knowledge transfer within an organisation. (Cohen and Levinthal 1990) Yeung et al. (1999:11) states that *"an organisation's fundamental learning capability represents its capacity to generate and generalize ideas with impact (change) across multiple organisational boundaries (learning) through specific management initiatives and practices (capability)"* This ability to capitalise on lessons learned in or outside organisation is also defined as *retentive capacity* (Szulanski, 1996).

Absorptive capacity has mostly been researched in the borderline between the firm and its outer environment (Scheimer and Riege, 2009) but it is equally important within the firm both on individual and organisational level shown in Elmquist (2007) article on project level. The absorptive capacity of the project team and the organisation will govern their ability to recognise and apply lessons from previous projects. If organisation can recognise and learn from short coming and success from a previous project and use that to improve the organisational processes so that it gives better pre-requisites for the upcoming projects there is a greater chance that the future project will not do the same mistakes and thus greater chance of it succeeding. Project studied by Elmquist (2007) did create loads of new knowledge, but the recipients due to knowledge specificity, engineering domains did not see any value in the knowledge created thus they did not find it applicable to their line of work. This shows a weak absorptive capacity towards norm and value oriented knowledge created in the project. Elmquist (2007) also concludes that receivers' absorptive capacity will have strong effect on knowledge transformation. Significant barriers to knowledge transfer are weak absorptive or retentive capacity, casual ambiguity arising with difficulty to recognise cause and affect of knowledge transfer and arduous sender-receiver relationship in an organisation. To transfer knowledge across boundaries in an organisation the knowledge must be perceived as useful to all actors involved. The relations and dependencies need to be understood as for why the different actors need to learn from each other to reach a goal, the willingness and trust between actors need to be at a level so that the absorptive capacity is sufficient to get the lesson across the boundary and applied e.g. process improvement.

The different factors affecting knowledge transfer that are identified in literature and previous research are summarized in table 2.

Elmquist (2007)	BMW article	The knowledge transformation cycle	(Scheimer and Riege, 2009)
the characteristics of knowledge transferred	form of knowledge e.g. context-specific knowledge applicable in other situations	novelty	contest specific factors
the source and the recipient of transferred knowledge	absorptive capacity, learning adaptiveness , trust and credibility, relevance and applicability	Difference, actors ability	relational specific factors
the context in which knowledge is transferred	strength and formality of network ties, communication chanells	dependencies	social specific factors
cost of knowledge transfer	cost of knowledge transfer	cost of knowledge transfer	

Table 2. Key influencing factors in knowledge transfer.
Source: The Author

3.4 Vehicles for knowledge transfer between projects

Goffin et al. (2011) identifies that formal mechanisms that simulate team learning are databases for lessons learned, checklists, and PPRs. PPRs are the most common and fundamental vehicles to transfer lessons learned between projects. PPRs require according to Williams (2003):

- *"a process to capture and disseminate lessons learned,*
- *'lessons learned' stored in a accessible location*
- *evidence of capture/dissemination and the reuse of information on subsequent projects"*

11

With post project reviews the organisation can identify and store the key experience which are relevant for upcoming projects. When the projects are coming to end there is a greatest chance for individual learning and transfer of lessons learned to future projects (Goffin et al. 2011). However, in most firms lessons learned from projects are not frequently captured. *"To often, the lessons learned from failed projects are quickly swept aside, with little effort expanded to trying to discover the useful lessons that can be carried over to future efforts"* (Williams 2003:445). Furthermore, there is a lack of identification of specific lessons learned in PPRs shown by the study. The usage of databases *"are appropriate for capture of product knowledge, but not for capture of softer learning"* (Newell et al., 2006:176). Softer learning being the tacit knowledge or novel knowledge created that is hard to transfer between knowledge specific domains. Williams (2003) states that in most firms the project team members are swiftly rushed to next project leaving little time for reflection on what went wrong and what can be done to avoid it next time. He also argues that management must devote enough time and resources for employees to reflect on past experience to find relevant lessons that can be useful in future projects. He continues on highlighting some problems with PPRs:

- *"they get access to logical decision-making, but are not good at getting the access to 'instinctive' gut feel*
- *there are problems with erroneous hindsight – in particular overestimating the amount of information a manger has on which to base his decision upon (e.g. evaluating a management decision using the outcome rather than the information management had at the time)*
- *difficulties since performers can not fully observe their own response"*

Goffin et al. (2011) concluded in their study that metaphors and stories that are associated with tacit knowledge were not documented in PPRs along with difficulty of finding studies that have identified specific lessons learned documented in PPRs and transferred as evidence of learning organisation. This means that important knowledge gets lost as the novelty of lessons learned are hard to document on a piece of paper as *"lessons learnt are closely related to specific experience and so are difficult to transfer, other than by direct interaction"* perceived by the personal in the Goffin et al. (2011) study.

PPRs and other documentation from past projects are often stored for later use. Carlile (2002) defines storage space as *"act of adding to the existing knowledge stock in active use by an individual, group or organisation."* Knowledge storage is a process of accumulation of knowledge from past experience. Knowledge can be embedded in tasks, activities, routines or artefacts that can be retrieved for use in later stage (Carlile 2002). Knowledge can also be stored in people. The retrieval process of knowledge will be depended on the experience and knowledge of the individual and their needs. As the activity complexity increases the retrieval process needs to be developed to meet the required increase of "*dependencies and source of specialized knowledge"* (Carlile 2002).

Also persons can be moved between projects to transfer knowledge (Knauseder 2009). One way to enhance interaction to transfer the knowledge across boundaries is by having mentors or brokers (Roth 2003). Knowledge can be stored in peoples' memory or individual experience from past project that can be used to not do the same mistakes again if the persons are still in the company and can retrieve the past experience (Goffin et al. (2011).

Williams (2009), argues that *"outcome of large projects is generally messy and the history is unclear, and structure is needed to establish the chain of causality"*. The modelling of such process explains the cause and effect relation and the feedback system especially quantifying the scale of such effects. The Strathclyde process is based (Williams 2009) on interviews of managers and documentation for the various circumstances that are later used for developing a cause and effect map for a project. A software is later used to analyse the maps and casual structure is build that is later used to identify triggers and feedback loops. Together with individual cognitive maps, casual chains and the cause-map the result of a project can be explained (Williams 2009). This is a form of System Dynamics that is a way for managers to understand how complex organisation system work and how it can be controlled with feedback loops. As with a flight simulator where a pilot reacts on information sent to him, by understanding the system dynamics managers could understand the complex relationship and properties that of their own system. *"The strength of System Dynamics lay in the construction of feedback loops to facilitate learning"* (Williams 2009:447). This insight in causality of project outcomes can be used to better understand the shortcomings and successes of a project and learn from them. It may make the transfer of lessons learned easier as well, because it gives a way to analyse the project outcome qualitatively and find out the cause of things that happened that can be described and transferred to next project or used to improve processes.

3.5 Cost and problems with knowledge management

Cost is also one of the more frequently described factors influencing knowledge transfer (Elmquist; 2007;Schleimer and Reige, 2009). Focus on efficiency and the time-constrains that are often associated with product development and automotive industry are highlighted. Managers are positive towards weak ties of knowledge transfer. Cost to build and maintain direct relations between different units outweigh the benefits of using those relationships (Hansen, 1999). Priority towards cost saving and efficiency in innovative and learning activities is also displayed in many interviews conducted in the Elmquist (2007) project study. Many managers stated that there is on systematic reflection and learning between projects when cost cutting was prime objective.

The time slack used for support of creating innovative solutions i.e. experimenting is shrinking in NPD organisations. The innovative process is ever more structured and the focus on cost cutting and strict planning in the process makes it harder for new ideas to be evaluated and absorbed (Elmquist 2007). The organisations are focusing on exploitation as it is easier to get short term gaining and it is less costly then exploration activities (Lavinthal and March 1993). The organisations behaviour concerning NPD activities can be set by management either to be explorative, exploitative or a healthy balance of the two in character. Exploitation creates reliability in experience through refinement, routinisation, production and implementation of knowledge. Exploration creates variety in experience through search, discovery, novelty, innovation and experimentation. When organisations either end up in either extreme they end up underperforming. For example any new innovation or introduction of technology will underperform during the first period of its life cycle because experience needs to be accumulated in using it (Levinthal and March, 1993). Exploitation pays of better in the short run as the accumulated experience is greater than in exploration activities. *"Exploitations are ordinary more certain, closer in time and closer in space than are the returns to exploration"* (Lavinthal and March, 1993:106). However, organisational structure can be used to strengthen exploration by undermining exploitation. *"Failiars to recall past lessons, to implement past solutions, to communicate about current problems, or to exchange feedback all contribute to inefficiency in refining current practice, thus to the development of experiments – all of them foolish, most of them distinctly unrewarding, but an occasional one or two containing seeds of a new direction"* (March 1988). It seems that the focus is on

delivering the project to lowest cost in time. Even though organisations and numerous studies have shown that learning organisations have competitive advantages there are few companies that are truly moving in that direction. Instead the time for innovation is shrinking, the process are more structured decreasing the innovative environment and there is no transfer of knowledge between projects leading to reinventing or doing the same fault over and over again. The short term winning of delivering projects is done on the cost of long term organisational learning. But question is what is more costly; inventing the wheel over and over or taking a step back and learn from the first time it was invented?

There are also scholars that question the over all possibility for organisational learning. Grieves (2008) question the scholar majority opinion on the ability and feasibility of organisations learning. Grieves (2008) points out contradictory of learning organisation *"That is, that a blueprint for designing an organisation contradicts the principles of a continual transformation."*. This means, that if one tries to structure a learning organisation the learning ca not happen as it happens when innovation is present. He also shows based on the study Jamali and Sidany (2008) amongst other that there is no consensus and the lack of parameters to measure the learning organisation and thus questioning its existence.

Learning itself has also its own traps (Levinthal and March, 1991). Learning in one area and gaining experience in e.g. a technology will improve immediate performance, but at the same time it will make the organisation not to pursue in a different technology (Levinthal and March, 1993) making the direction of learning a bit off a gamble. Or as Levinthal (1993:106) means *'learning reduces visibility'*. If the environment changes and in form of different customer demands or different legislations the organisations that has invested in wrong technology or learning will experience poor performance. Learning competence means becoming better at things that organisation does reputedly with successful outcome and looses competence at things they do less frequently or without reaching the wanted outcome (Holmqvist, 2004).

"Learning is likely to be misleading if the experiential records on which it draws is biased representation of past reality, and thus of future likelihoods. Organisational learning produces such a biased history. Learning generates success rather than failures" (Levinthal and Marsch, 1993:104). Successful organisations are viewed as capable of learning and adapting their technologies and rules or processes based on their experience (Stalk et al,.

1992). Hence, experience can be a poor teacher as it contains limitations. Experience involves taking conclusions from information which in turn need simplification of the problem. It also involves memory that can diminish over time or change, it involves individual personal experience and the biases enclosed in subjective view of a situation or a happening. Even the brightest individuals and most capable organisations face the problem of making sense of a complex situation from a narrow view of certain individuals that describe their experience (D.A. Levinthal and J.G. March, 1993;Brehmer, 1980;Fischhoff, 1980).

The learning capacity of an organisation can be partially explained by the structure and/or its behaviour when it faces underperformance that can be seen as failure. Operational experience has impact on the organisations ability to learn from failures. Vinti's hypothesis that generalist organisation that have accumulated multi disciplinary experience are best suited to learn from failure. In this article it is concluded that generalist organisation might be better suited but that the operating experience will have a strong impact on the capability of organisation learning from failures. Levinthal and March (1993) agree that learning presumes interpretation of experience but they also state that "*Experience is clouded by the interactive complexity of history*". So learning from experience is a complex process especially if there is simultaneously learning by other actors. Outcomes from a certain event such as a project that is defined by a time span are defined as success or failures by organisation and the ideas about the causes for them are developed. However in the article by Elmquist (2007) the car manufacturer can be seen as generalist organisation with multidisciplinary operational experience still they fail to absorb the knowledge from the prototype car project.

Summarising the theoretical framework the ideal process for knowledge sharing would be a feedback loop between project and the NPD organisation illustrated in figure 1 where the differences and dependencies are known with a common language in use between different knowledge specific domains. The Process Management (PM) would use the project experiences from e.g. Project X to adjust the working processes in line organisation relative to the experiences from the project. The experience from Project X would be stored into the working processes that would be later used in the subsequent project e.g. Project Y. The subsequent project would start from a higher state of knowledge using the past experience from previous projects and build upon it with knew knowledge. "*If experience and knowledge gained in one project is transferred to another in an efficient way that team can start at a higher knowledge level than if that situation does not exist*" Ottosson (2009:103).
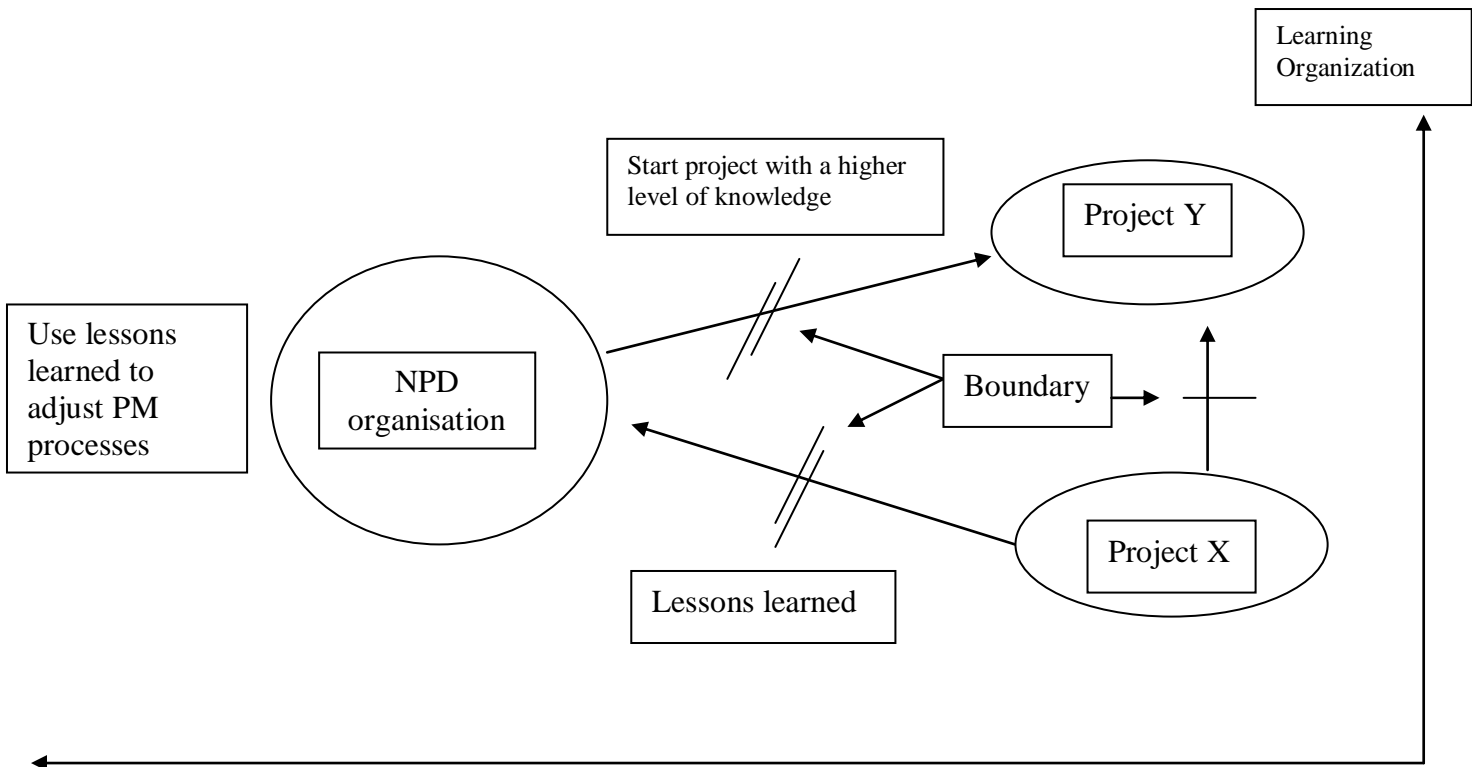
Figure 1 Project – to – Project Learning Diagram

Source: the author

3.6 Narrowing down

The case study is conducted on the company and the unit of analysis is the process of knowledge sharing and transfer from a management perspective. The focus will be on project management process problems and not on technical problems and the lessons learned from them. Research will be conducted only on knowledge sharing between project and line organisation and other project. The paper will not treat the creation process of new knowledge the focus will be on sharing and storing the knowledge. The centre of attention of the paper will be on the transfer of lessons learned from NPD projects to organisation lines that can later be used to improve working processes until the subsequent project. Furthermore, the study will treat intra-organisational learning only. Even though the intra-organizational learning is in close coupling to inter-organizational learning the lessons learned in projects in the given NPD organisations are not open for public and are not shared to other NPD organisations. The study is done on PPRs from six projects and the documentation from them. This case study will only treat at a local level thus in one specific company in one country and

17

not on a global level. The projects that are analysed are of the highest class and have major impact on change in technological development and in knowledge creation.

4. Methodology

The nature of the problem, the researchers wanted result and the questions being raised will govern what type of research method that will the researcher will choose (Björkegren, 1999). With qualitative research the researchers' aim is to gain understanding of the respondents' world view on problem or the issue investigated. The aim is not to bring the meaning from literature or researchers own perspective (Creswell, 2009).

Little research has been done on the concept of project-to-project learning. This gives way to preferably use a qualitative study to describe the concept and ad to the theoretical framework (Creswell, 2009). A quantitative approach would be best for identification of factors that influence an outcome (Creswell, 2009) thus answering questions such as; what variables or parameters will affect knowledge transfer across a boundary? This could be used to better understand the mechanisms that influence organisational learning. However, the empirical studies that have been conducted on subject closely related to project-to-project learning i.e. organisational learning, illustrate lack of consensus (Jamali and Sidani, 2008) and lack of parameters (Grieves, 2008). Thus the qualitative study would be a better choice as important variables to examine are not known (Creswell, 2009).

4.1 Case study

There are different strategies that can be selected to conduct a qualitative study. The best suited strategy for this study is a case study. Case study can be defined as "*a strategy of inquiry in which the researcher explores in depth a program. Event, activity, process or one or more individuals. Cases are bounded by time and activity, and researcher collect detailed information using a variety of data collection procedures over a sustained period of time*" (Creswell, 2009:13). As the aim of this study is to investigate the process of project to project learning and the study is set by a time frame the case study will suite for the aim. It will also generate in depth explanation form the people that are working in this process daily what they think the problems are and how they can be solved. This will hopefully have higher impact on

the willingness by upper management to make changes in the organisations. Also higher validity will be created if the arguments are coming from colleges. The not-invented-here arguments and arguments that findings from other case studies are not applicable in the given organisation loose ground with conclusions based on perceptions from the members of the given organisation. The case study will explain the settings in depth (where the research will take place) the actors (who will be interviewed) the events (what will the actors be interviewed be doing) and the processes (the evolving nature of events undertaken by the actors within the settings).

It is believed that generalisations from one case are not promising. There is greater chance of conclusions and results being biased in single case studies. Furthermore comparative studies add more to scientific inquiry compared to single case studies (Yin 1984:21). However, case studies do not strive only for generalisations. There is a scientific value to gain from investigating a single category as in depth research is done in one sample (Berg 2004:259).
Even though it is possible to generalis from a single case study this should be avoided. Instead single case study could be used to create new knowledge and turn research in different direcation. Lijphart (1971) argues single case studies can still make significant contributions, even though a case study per se cannot be generalized. Through in-depth analyses of single case studies, the researcher can think in new terms in order to produce new ideas. An in-depth study on organisatinal learning in the give organisation allows me as the researcher to focus on the specific contexts in the chosen case. A single case study still allovs the reasearcher to take different perspective. The advantage with single case study is ability for the researcher to study a phenomenon more intensively reducing the risks of misinterpretations (Lijphart 1971:691).

The company studied is one of the largest manufacturers of heavy duty transport solutions such as trucks, busses and construction equipment. The company has ails and service organisations in 140 countries and assembly factories in nine different locations spread world wide that deliver the products to different markets. The engine development is just a part of the global development of entire transport solutions. The engine development is also a global organisation with different sights placed on different continents. The different development sights need to cooperate to handle the development needed to meet the ever so strict emission legislations on different markets. The engine development projects use a process with project

gates to handle the different phases from a concept to a fully industrialization of a product to end customer usage. The projects are divided in different classes that represent the size of the project, the resources and time the project completion needs. The projects that will be researched are of highest class. These projects introduce most of new technology development and by doing so they bring change that gives learning opportunity. The projects are almost consistently run to meet the emission legislations. The goal with the interviews is to investigate project teams and other employees in the organisation view on the PPRs process and the ability to improve it. They are part of a project organisation that is illustrated in figure 2.
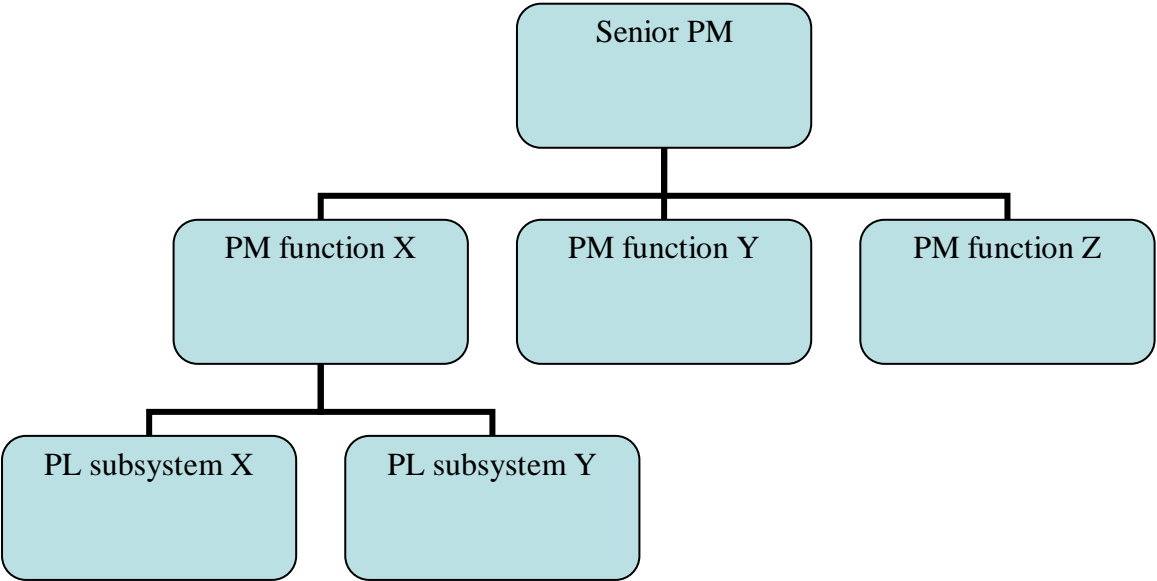
Figure 2 Project team organisational chart

Source; the Author

The Senior Project Manager (SPM) is responsible for the PPRs (Past Project Reviews) creation during project and formalization at the end of the project. The input to CPM is given by the PM (Project Manager) that sums up the experiences from his or her function. The input to the PM is given by PL (Project Leader) from different subsystems who in turn get input by the line functions if they get involved in the process. The project team are responsible with

SPM as the highest responsible to deliver a complete product to a customer. Technical changes on products industrialisation projects are run to verify that the product meets the requirements from different functions. To help the project team, the project time is divided into different phases that each begin and end with a gate. The gate has specific criteria that need to be fulfilled in order to continue to the next phase. The project team presents the status to gate keepers that are senior staff and managers that decide to open or close the gate relative to the results and recommendation put forward by the project team.

4.2 Secondary data

The theoretical framework was based on articles and books. Along with the data from interviews the documents from previous projects were also analysed. These were source of secondary data that were collected for the research. Official documents derived from privet actors are commonly used as and produced in abundance in companies and organizations (Bryman 2009). There are documents that are published in public domains such as World Wide Web but there are also documenters' that are confidential and only used inside the companies domains. The confidential information might not be easily accessible even for persons inside the organization as they may contain sensitive information of companies' strategy, decision making, and requirements amongst other important source of information. However to conduct a case study on organisations using such methods as participant observation the researcher should have access to all documentation and together with qualitative interviews the researcher can a make qualitative study (Bryman 2009).

Documents, mainly PPRs and/or PowerPoint presentations derived from PPRs, from 15 different projects were studied. The content in the PPRs were dependent on how the author wrote them. Some were written as word document, others were Excel sheets and PowerPoint presentations. Thus the quality of the content differed a lot. They mainly contained five top and five bottom lessons learned or experiences in the project. Form the 15 PPRs studied seven were selected to conduct for further research on. These were more elaborate PPRs and contained from every function e.g. engineering, purchasing, manufacturing etc. their experiences and recommendation. The PPRs structure was made up of a template that had three fields to fill out; experience, effect, and recommendation. These recommendations were lessons learned from projects. The lessons learned and improvement suggestions are hopfully shared with subsequent projects. The PPRs selected were from the largest projects that had

major impact on technological and organisational development. These projects had relatively well written PPRs that contained a lot of well described lessons learned. Using the documentation from PPRs the questions and themes were outlined and written that were later used when making the interviews. By doing so more in depth information was gained on certain aspects of unwanted outcomes from projects that were documented in PPRs. The interviewees were not selected in respect to the project documents studied. They answered the question generally not specifically for certain project. They did however when recalling certain events mention in which project this happened.

4.3 Data collection

Bryman (2009:552) states *"People who write documents are likely to have a particular point of view that they want to get across"*. This is also called simple observation and the authenticity and credibility of such documents is confirmed but members of different groupings tend to have different understanding on what happened at a certain event reflecting their position in the organisation. *"Therefore, documents cannot be regarded as objective accounts to a state of affairs"* Bryman (2009:522). To balance bias in the secondary data, semi-structured interviews were also performed to gain further credibility and understanding in the findings. The documents were analysed to identify what type of knowledge is documented. Focus was on finding the lessons learned from previous projects that are repeated. This was used as evidence if found that the project – to – project learning does not work as intended. To collect data for the research semi-structured, face – to – face interviews were conducted with managers from the project and line organisation and purposefully selected participants that help the researcher with the quest to gain knowledge of the problem or issue. This is different from quantitative research where the samples are more random and large as to statistically secure the results (Creswell, 2009). The structure for quantitative research is a lot more rigid then with qualitative research as the aim of the research is to *"maximize the reliability and validity of measurement of key concepts"* (Bryman 2008:437). Qualitative researches use interviews due to their flexibility when gathering data. When it comes to the structure of interviews the most commonly used are unstructured and semi-structured interviews (Bryman 2008). Other advantages with qualitative interviews are; participants can provide historical information, allows researched to control the line of questioning, and are useful when respondents can not be observed. The drawbacks are filtered

information form the eye of the beholder, articulate capability will be different from different people, researchers' presence and choice of questions can lead to bias (Creswell, 2009).

4.4 Semi-structured interviews

The interviews are focused on the project teams as they are the ones contributing to the creation of PPRs. When the interviews were conducted an interview protocol was used. The outline for such a protocol is given by (Creswell, 2009:182). Ten face-to-face interviews were performed with different members of the organisation. The answers became repetitive after six interviews however as the goal was to capture all the project team ten interviews were conducted. The length of the interviews was up to one hour per interview. The main topics that was discussed during interviews was the awareness of organisational and project-to-project learning , the ability to learn from projects, and in what way the learning from projects can be improved. One goal of the interviews was to capture the retrospectives of respondents on what went wrong and what was missed or omitted in the learning process of capturing lessons learned.

The respondents chosen for this study were Project Managers, Senior Project Managers and Line and Section Managers. The Project Managers will be from different functions such as Engineering, Purchasing, Manufacturing and Quality to capture what kind of lessons they think are important and their views on usage and documentation on lessons learned. These persons are responsible for trade-offs and compromises to deliver a product in given constrains of time, resource and quality. They are also responsible for communication between different projects and are involved in all project outlines, and outcomes making them highly interesting. The Senior Project Managers have the main responsibility to deliver a product that meets all the requirements to the end customer. Line managers are responsible for their line functions to deliver to the projects according to processes and routines. They are responsible for the personal and resources at specific line functions. All of the respondents described above are held responsible in some degree to deliver the project. The CPM and PME work cross-functionally to deliver the product but the capabilities of line functions will determine the quality of the end product. As the study is trying to capture different perceptions of certain projects, activities the respondents should have different view angels on problems.

4.5 Data analysis and interpretation

After the data was collected an analysis was made. To increase the reliability and validity of the qualitative research the structure of data analysis and interpretation was made in a structured way shown in figure 3. The analysis contained eight steps shown in illustration below. After collection of data from interviews and documents the data will be coded into segments of information that will later be used to create meaning of it. Codes can either derive from interviews, be predetermined literature or a mixture of the two. The coding in this study is a mixture. The documentation from past projects along with the literature is used to develop a qualitative codebook (Creswell, 2009) however when new codes emerged during the interviews they were added. The purpose of using coding is to have a structured way to process the large amount of data from projects and interviews.

The focus of coding was to find reappearing lessons learned or problems spotted in projects. This was then used to understand why they happened in form of themes e.g. lack of communication and what can be done to resolve the issues e.g. more accessible documentation.

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┌─────────────────────────────────────────────────┐
│ Interperting the Meaning of Themes/ Descriptions │
└─────────────────────────────────────────────────┘


┌─────────────────────────────────────────────────┐
│ Interrelating themes /Descriptions (e.g. case study) │
└─────────────────────────────────────────────────┘


┌──────────────────────┐        ┌──────────────────────┐
│ Themes               │        │ Description          │
└──────────────────────┘        └──────────────────────┘


          ┌──────────────────────────┐
          │ Coding the data          │
          └──────────────────────────┘


          ┌──────────────────────────┐
          │ Reading through the raw  │
          │ data to build a general  │
          │ understanding of the     │
          │ results                  │
          └──────────────────────────┘


          ┌──────────────────────────┐
          │ Structure the raw data   │
          └──────────────────────────┘


          ┌──────────────────────────┐
          │ Raw Data Collection      │
          └──────────────────────────┘
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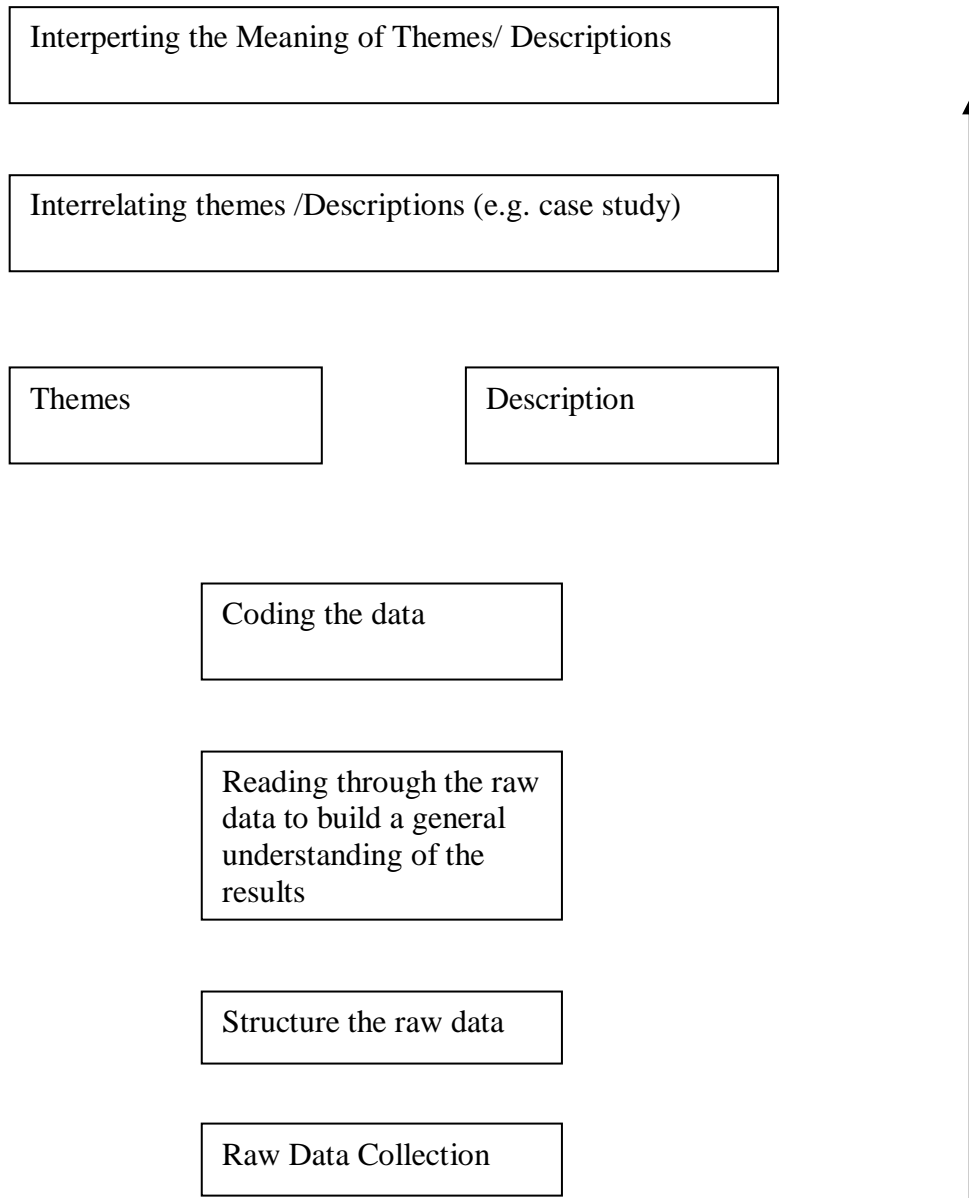
Figure 3 Analysis and interpretation of data

Source: Creswell 2009

5. The code of conduct, today

The company runs projects to develop and industrialise new products and to cope with the
development of new technologies in order to meet customer demands. Projects are the *bread*
and *butter* for the company. The projects are divided in different classes that characterise the

size of the project, the resources and time the project needs for completion. The projects initiation is performed by the product planning and the upper management that introduce the project to meet customer demands. When the project is approved the new product development project team use a gate process with project gates to handle the different phases from a concept to a fully industrialisation of a product that can be sold for end customer usage. At each gate the project has targets that it must fulfil to pass to the next phase. These descriptions are documented in a specific process that is globally used and all projects must follow so-called Global Project Process (GPP). The process insures that a project is delivering according to set targets concerning quality, cost and time at the same time it gives a possibility for a controlled introduction of change into the organisation. Also it makes sure that the projects are run in the same way thus giving a better way to predict outcomes and control projects. The project team is responsible together with Senior Project Manager (SPM) as the primary responsible to deliver a complete product to customer and to follow the GPP. The project team presents the status to gate-keepers that are senior staff and managers which decide to open or close the gate relative to the results and recommendation put forward by the project team.

The goal with the interviews was to research the workers view on the PPRs process and the ability to improve it. They are part of a project organisation that is illustrated in figure x.
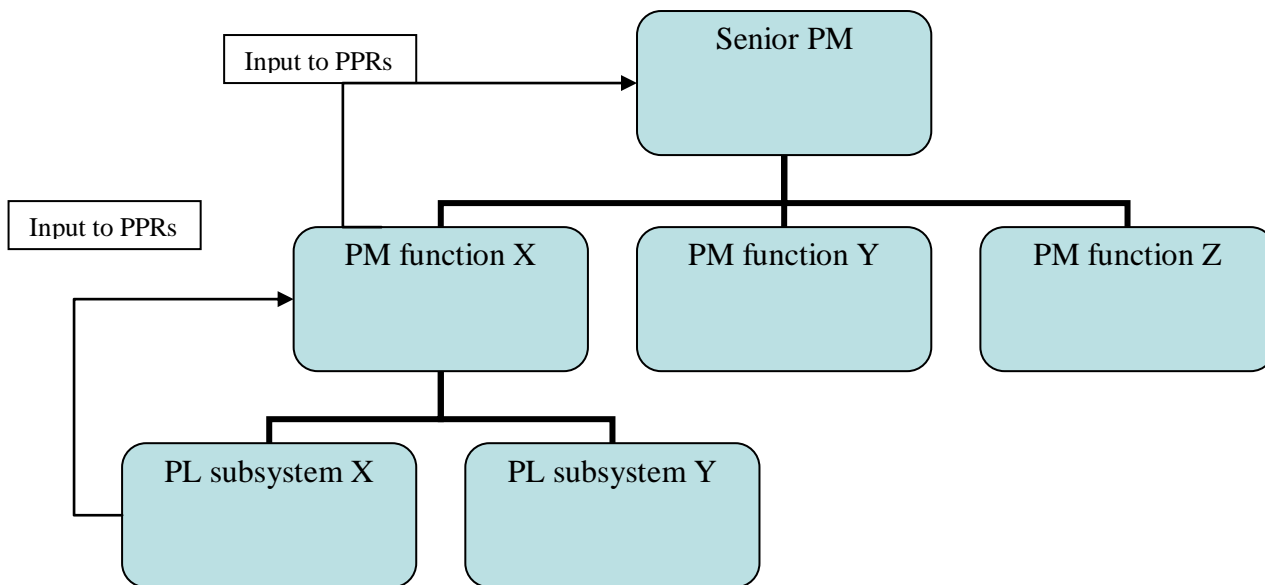
Figure 4, The PPR input process in NPD organisation

At each start and finish of a project the PPRs come into play. The GPP describes how the PPRs are supposed to be used in every project. The instruction in GPP states that for every project before the start of it the project team needs to read old PPRs from previous projects to learn from their experiences. It also describes the process how to set up and run a PPR. The PPRs are written at the end of the project however throughout the project the project team should use the project place and document their experiences. At each gate there is a criterion that the experiences must be written down in to a log that will be later used for PPRs. The Senior Project Manager (SPM) is responsible for the PPRs creation in start of the project, keeping it alive during the project and formalization at the end of the project. He/she together with the project team is also responsible for reading old PPRs and capturing the experiences. The SPM is the one that controls the amount of time along with the project team that is put into creating the PPR. The input to SPM for the PPR is given by the PM (Project Manager) that sums up the experiences from his or her function. The input to PM is given by PL (Project Leader) from different subsystems which in turn get input by the line functions if they get involved in the process. The whole process of PPR is dependent in what way the SPM works with the tools given in the organisation. This should in theory mean that the project would not repeat the mistakes if they capture the experience from the past project.

The line organisations are divided into subsystems responsible for given functions of the product and should be seen as experts in the given field. The resources are shared between the

projects so a person can work with several projects at the same time. Projects work cross functional and they are responsible to answer questions of what needs to be done and when to deliver the project by making a project plan. The line organisation answers for questions; who will do the job and how the job needs to be done.

5.1 Data analysis of PPRs in use

The first part of the interview protocol is focusing on the PPR itself. The aim with these questions is to find out how the PPRs are perceived in the organisation to answer questions such as; are they easy to use, find, and understand. Goffin et al. (2011) identifies that formal mechanisms that simulate team learning are databases for lessons learned (e.g. PDM), checklists, and PPRs. PPRs are the most common and fundamental vehicles to transfer lessons learned between projects. PPRs require according to Williams (2003):

- *"a process to capture and disseminate lessons learned,*
- *'lessons learned' stored in a accessible location*
- *evidence of capture/dissemination and the reuse of information on subsequent projects"*

The questions that are presented in graph 1 are used to see if these fundamental requirements are met by the present PPRs and process for them in the company. The questions are structured in such a way that it is possible to answer with yes or no without any explanation. However the respondents in all interviews gave a short explanation why they gave either a positive or negative view on a given question. This type of question gives an indication on how well the PPRs are functioning in the organisation.
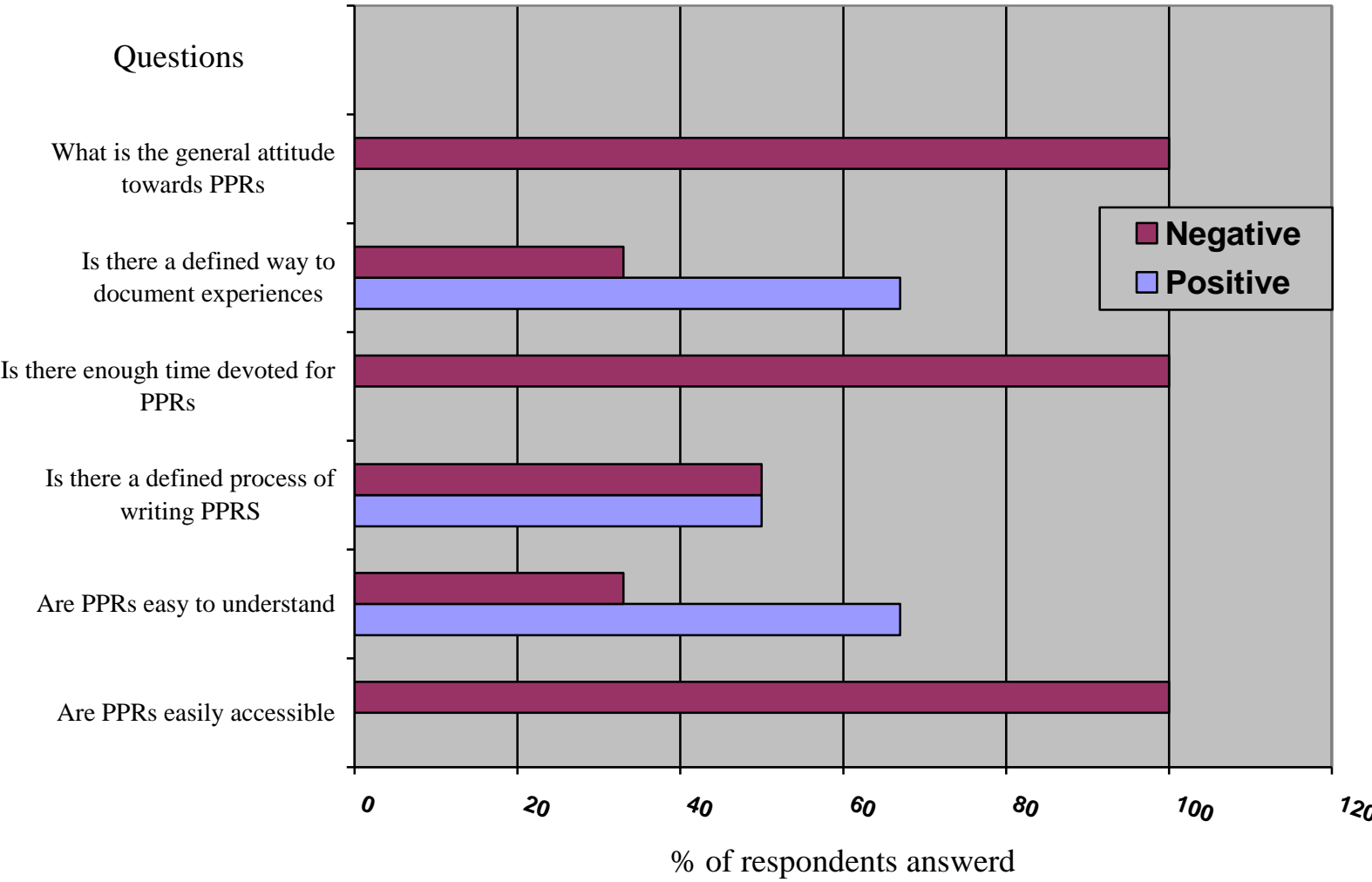
Graph 1 The result from questions about PPR

Source; the Author

5.2 Accessibility of and devoted time to PPRs

The PPRs, even though they are stored in a system that is accessible to all, are not within reach as they are perceived hard to find. In graph 1 it is easily seen that all the respondents perceive PPRs as hard to access mainly because they are hard to find and too little time is devoted to PPRs in their line of work. The results show a very serious problem with

knowledge transfer in the company as both time and accessibility aspects of knowledge transfer are perceived as negative. If people working in projects find information hard to access then the search for it will be brought to a minimum. One interviewee explains his/her view of PPRs *"..they are a bit secretly. They are hard to find. It is rigidly controlled where they are stored but they are not accessible to all in the project."* Another respondent comments *"I actually don't know where to look. I look in one file called PPRs, and I read it and then find out that there is another place for storage in the same project. I feel unsure that there is standardized way to store PPRs."* The apparent trouble to find PPRs hinders employees from learning from previous mistakes and they will most probably repeat them which cost time and resources.

Also the respondents feel that there is not enough time for working with PPRs i.e. time is not prioritized to deal with capturing and reusing past experience. The time to work on organizational problems once the project is delivered is very limited if any. One respondent explains *'There is no time to take responsibility of it once the project is closed'* When the project ends nobody takes care of the problem as nobody is asking for a solution until the next project starts. One of the interviewee explained that *'One should not start to deal with the same problems when the project is starting because then it is too late'.* At the stage when project teams start reading the PPRs it is already too late to focus on follow-up processes and solving organisational problems, as the focus is on delivery.

Even though the learning from PPRs is not positively viewed upon in the organisation the learning from past experience is distinguished as important. The most common attitude towards learning from past experience is that it is wanted and important but there is no time for it. One of the interviewees commented *'we do not have the time to switch to a round wheel'.* This is a common used illustration in the company where a hectic man pushes a cart with square wheel and doesn't have time to listen to people that want him to stop to switch the wheel to a round one. The illustration on picture 1 and the comment capture the essence of the problem. The employees are aware of the problem but they do not have the time to do anything about it. Due to this state they end up in the same situations facing similar problems in every project. Many of the respondents point out that delivery on time is the most important aspect in running a perceived successful project. One of the interviewees explains *'Final delivery, the date that is promised to the customer, is what counts'* and this is the priority in the organisation. It is not prioritised to learn and work with long-term development of

processes and organisational strategy. This should be done along the way. The prioritisation is to deliver the project according to the date that was agreed. Everything else can wait.

Picture 1 Illustration of the problem with prioritisation: "Do not have time, have to work"
Source; the Author

5.3 Lessons learned

When asked if the respondents know of a company policy that encourages them to learn from previous projects they identified PPRs as the only process they can think of. However the PPRs are mainly for the project teams to learn from past project experiences. The overall policy stating that it is important to learn from past experience was not defined by any of the respondents. It is also mainly the core project team (PM and above) that reads the PPRs and tries to learn from them. The other functions PL and WPL only contribute or get involved if specifically requested by the PM. The respondents did however point out that learning from past projects is taken for granted with comments *"that is built into walls"* meaning that it does not have to be spelt out. There is also a view that it should be in everyone's own interest to learn from past experience.

During the interviews the respondents were asked if they know of any problems that have been repeated in projects. The answer to this question indicates what sort of knowledge is not transferred from the projects to line-organisations when the problem remains. Eight out of ten respondents identified work processes related problems as reappearing problems in subsequent projects. Respondents also identified working methods as the most important

lesson that needs to be passed on to next projects. The interviewees discuss that mainly planning, documentation and project start up are knowledge that they perceive as deficient in PPRs.

This is closely consistent with the result from the analysis that was done on the PPRs themselves. The reason for conducting the analysis was to find themes for interviews and reappearing lessons learned identified and documented in different subsequent and/or parallel projects PPRs.

The results of the analysis can be found in table 3. In the upper fields the lessons learned are represented deriving from PPR document. These lessons that were specifically described in a PPR for a given project are marked by a **x**. If the same lesson learned is described in proceeding project then the organization failed to actively use the lesson learned. If the same lesson learned was also described in a parallel project the lesson is general. Parallel projects have same number i.e. 01, 02 etc. So e.g. X01 happened simultaneously as Z01. This indicates that the problem is not project specific and that working methods in line organization. A subsequent project is shown by iteration of a number ex. X02 is subsequent project of X01. This shows that there are mistakes identified in a project that are inherited in other projects. The blank squares represent a lesson learned that is not described in given projects PPRs. This does not mean that the lesson learned was not experienced by the given project but as the PPRs are written by CPM they can choose what to include and what to exclude from PPRs.

Project	Lessons Learned												
	Scope not set	Decision path unclear	Resources not planed/ secured	Concept maturity	Supplier issues	Release plans not respected	Documentation issues	Quality issues	Front loading	Budget issues	Scope change	Unclear roles	Process issue
X01	x	x	x	x	x	x	x	x	x	x	x	x	x
X02	x	x	x	x	x	x	x	x	x	x	x	x	x
Y01	x	x	x	x	x	x	x	x	x	x	x	x	
Y02	x	x	x	x	x	x	x	x	x	x	x	x	x
Z01	x	x		x	x		x	x				x	x
Z02	x	x			x		x	x			x	x	x
P01	x	x	x	x	x	x	x	x	x	x	x	x	x

Table 3Result from analysis of PPRs and the lessons learned
Source; the Author

Evidence of capturing lessons learned and reuse on subsequent projects was indistinct. Even though a number of PPRs were analysed a notification that the project team had read previous PPRs, used explicit lessons to work differently, as well as referring to this process in their PPR was not found. There is a lack of evidence that the PPRs were used to transfer lessons learned to subsequent projects. There were no comments written about this subject in the PPRs analysed. This does not mean that no lessons are passed on. There is evidence from the respondent's interview answers that people who have worked in previous projects share their knowledge and experience on what works and what doesn't work in meetings and during informal discussions. So the knowledge sharing happens but it happens through social interaction and networking.

The lessons learned that have been documented in PPRs are repeated in subsequent and/or parallel projects. The characters of problems identified are all related to project management profession and organizational processes. The problems are the same problems as respondents identify as the repeatable problems at the most important ones that need to be transferred. All of the respondents gave similar answers showing that there is a process in how to document lessons learned but no process on how it is actively used. The problems are documented and stored until somebody reads them. Some of the respondents could point out where the PPRs are stored, but there was no answer on what happens with lessons learned, documented in the

PPRs, after project closer. When asked what happens with lessons learned after the project closure one of the respondents replied *'Hard to say. If one writes a PPR one hopes that somebody else that is responsible reads it before they start the project. And, probably the way we work we don't read them enough before we start'* other comments were *'They get forgotten in general. The PPR just lies there until somebody has to pick it up. I don't think that somebody intentionally picks it up every time'* one of the respondents stated *' I don't see what happens. I only see that many of the problems that I wrote down in my previous project are still present in the organisation. This is what I see.'* Information from interviewees give a sense that there is no process to take care of the lessons learned that are identified in the project after the project is closed.

5.4 Technological knowledge transfer and soft skills

Projects also create artefacts that are passed on. Especially artefacts are present in the given company in form of products that are being developed. The products are a form of shared knowledge incorporated in the product that is passed on to the next project to further development. The project does not start from scratch when developing a product for a given emission legislation. The project uses an existing product and develops further on it thus the knowledge that was needed to develop the original product is shared by the subsequent project reusing their knowledge and adding on knowledge by further development. In this sense the knowledge sharing happens by the artefacts created in the project.

However, the softer knowledge is seen more difficult to transfer than technical solutions such as artefacts. One project manager for engineering explains when asked to give example on lesson learned *"that was it, yes slightly work process related, but nothing about responsibility and that. It was a technical question. It is a bit easier to solve. Technology is the whole work process. This is what we won't do again, we will make sure to look at the requirements"*. The interviewee point out that technology is what is important even though he unintentionally described a work process in which they implemented how to deal with new technologies by using requirements. As the company researched is a technical orientated company, in some cases discussion ended up on how technology is passed on. The respondents had more positive views on the ability to transfer technical knowledge then process related knowledge with PPRs. One of the interviewees explained *'Working methods.... It is easy to talk about all*

the things that are bad with working processes concerning customer and supplier relations....
I don't know if this is important because it doesn't seem to matter. The problems have been
there for three consecutive projects. On the other side things that have to do with technology
are easier to do. These technical issues do not work, these systems do not work, and these
sorts of things are easier because one is able to influence one's own destiny.' The respondent
does not feel that the working processes can be changed instead he points out that the
technology development is easier as the PM is able to influence it.

The technical problems seem to be more interesting and easier to solve then discussing the
working processes and methods. One respondent comment: *'We are a technical orientated*
company... purchasing function is needed as a counter weight... Engineering is prioritized
and that is good in some cases.' The reason for prioritizing engineering could be found in
another respondents statement *'It maybe has to do with our in heritage, and maybe to some*
extent how you employment people to management. They tend to be engineers at heart,
problem focused and enjoys technology, this is a bit of a trend.' It can be argued that as
engineering is strongly represented in the steering committees and management, engineering
problems get more attention than for instance work-process related issues. This will impact on
what issues are prioritised; the technological challenges or the organisational development. It
will also have impact on what lessons are learned, how to design a turbocharger or how to set
up relations between two sights.

5.5 Informal way of learning

Even though the PPRs lack of functioning in the given organisation and effectiveness to
transfer lessons learned can be improved, there is still knowledge transfer that happens. The
PPRs are the official way for project teams to learn from past experience from projects. The
project teams are responsible to read through the PPRs from previous projects and learn from
them. However the respondents point out during interviews that they learn more through
informal ways such as asking people, informal meeting forums and interviewing each other
compared to learning from documentation. *'We had this during EGR projects every 4th week*
the project leading the technical development told us, what is going on, what problems they
have encountered, working methods and technology. All other projects inherit this and I miss
these meetings. It's like a club, or informally where one shares experiences without having to
think about being politically correct but one goes straight to the point, this is what works, we

have figured out these good solutions, these documents should be used'. The conclusion can be drawn that it is easier to transfer knowledge from others by personal contact compared to documents. The PPRs are seen as an ineffective way of transferring lessons learned. Personal contact is preferred; *'to look into a document compared to talk to someone it is really easy to choose which one I prefer…You can get a lot more information about the circumstances. I feel that PPRs work a lot better when you sit in meetings and have a discussion and that works well as long as the projects are alive".* The interviewee prefers to talk to people that have worked with similar problems compared to trying to read the PPRs and extract lessons from them. Another respondent explains *"We are also urging, when one reads the PPRs and tries to learn from it, at the beginning of the project, it is not enough to only to read the PPR you should interview people as well… Sure PPRs are good but you can not extract soft things that are often omitted. How did you do with project team meetings, how did the agenda look like, a bit more things that are not usually written down in PPRs."* Similar comments are put forward by most of the respondents and all but one have on daily bases sleeked information through direct contact with people that work with similar tasks. The one respondent that did not seek information from others was a line manager and the line manager did not think that others could contribute to the work. As long as people stay in the company and can be reached by a visit or a phone call this way of transferring knowledge is possible. But when people leave the company they take a lot of knowhow with them. The strength in process update and adaptation is that the company becomes less sensitive to people leaving their workplaces. However the danger with this way of transferring and storing knowledge is pointed out by a respondent *'People get replaced but processes are still there… it is very dependent, how you put on a task, you will get a totally different layout on work process and output. And that I argue says it all. Then you don't have defined working processes thus you can't put strict demands on the other functions'.*

5.6 Process update responsibility

The main problem with PPRs that has been pointed out by most of the respondents is the ownership of the problems after the project is finalised. ' *(...) there is no clear owner (...) Some of us realise, this is important for me and for the future (...) but if there are a lot of things that need to be done and somebody gets a bit difficult task to deal with it just perishes. Because nobody is following up, nobody is the owner.'* Another respondent explains '*nobody says, yes, I will take care of that, this is my responsibility. It is in my line of work to improve*

myself so I will take this issue.' Nobody wants to own the problem. Thus after the closing of the project the problems are there until the next project starts. Who is responsible to make the necessary change of a working process that is not delivering the requested output by the project? It seems that there is an unwritten rule that the PM/SPM should drive change on organisational processes that do not work inside the project scope. This is a very interesting fact in the given organisation, that even though the PM is responsible to drive the change and develop a product, it is also expected from him to fix small errors in the organisational chart that he might in counter. A respondent with extensive work experience with projects as PM and SPM states *'... every project is responsible for driving through these things at the same time as the project runs. So the errors in processes are the responsibility that one has to deal with before closer of the project. This is my opinion. One should not expect somebody else to do it for you'.* One of interviewees explained when asked to give an example of a lesson learned *" it's when you read things and see where other have had problems and you don't fully understand them so you end up in the same trap as they did. Example, budget process.. yes, I have my money and it all works well but even though I end up in having same problems. This is a typical thing. Which maybe builds upon, the process was not changed so it didn't work now either".* Here the respondent actually points out the problem that is the root cause ending up in the same situation as the previous PM but the respondent then continues explaining *'I didn't take it seriously from the beginning. I didn't realize that I should maybe do something more then what the documented process say because the other ones had problems with this'.* The interviewee describes a feeling that it is up to the PM to deliver the project regardless if the work processes are in place or not. This can be justified if the processes are overviewed after the project ends. But as the respondents also points out they fall into the same traps even if they read about the mistakes from previous projects. Thus only writing about the problems does not make them disappear.

When one of the respondents was asked to answer the question if they felt that there is enough attention from the upper management on the problems in the PPRs the interviewee replied *"To put it simply, no. This is a prerequisite... And I don't know if there is a part in our contract one has as an employee. You have two tasks, one is to do your job, and the other one is to improve it. So it is in the tasks nature".* Thus upper management expects that organisational learning will be a self-playing piano. Unfortunately the evidence seems to point in the other direction. One of the PM answered to the question *"If mistakes are repeated why is that and how can it be avoided"* with an explanation regarding upper management

involvement *"I don't know. Especially the issue with work processes the upper management must get more involved to try to solve the problem. Because they are the only ones that can solve the problems on management level... I think that most of it can be solved if there is a will to do it. It is all about willingness. It can't be about one PME solving everything by himself. It reappears in every project, then it is not about one specific PMEs' performance. Often there are a lot of PME that fail."* This is directly contradictory to some of the comments from respondents that feel that it is up to PM/SPM to manage these changes in the scope of the project. *'Because, we can't influence the working methods as PME. Those things are more of academicals interest to us. We can't get through. It is not on our level we do not decide the working procedures.'* Some PMs are expecting the upper management to get involved and solve the issues on a higher level. They feel that work methods and processes are above their authority and cannot be solved on a PM level. On the other hand other PM especially those closer to upper management seem to have different understanding on who is responsible to make the necessary changes. This unclear responsibility for the process related issues leads to a status quo and the mistakes are repeated in subsequent projects.

The challenge that needs to be addressed adequately is *"to create a common interest to share knowledge requires significant practical and political effort"*. The practical effort could be managed by PM/SPM as part of the closer of projects. However the political effort rests on the upper management initiative. The interviewees showed an indication that they lack the involvement and commitment by the upper management when it comes to finding root cause and implement changes that were identified in projects *".. even though we know from past experience this should be avoided, it still happens. One is not able to govern ones projects in every aspect. You get allocated a timeframe, working conditions and work split from the beginning even though it is known that that set up will create problems. Still one is not able to influence that. Some things are decided on a higher level."* One of the interviewees state *"Problems from PPRs are exceedingly noticed but the process for learning from them I find it inadequate. I believe that we should have a process where we sit down and analyse the outcome for major events. No I don't feel there isn't enough focus on this they don't think in long term"*.

Own initiative was explained by some respondents as very important when it comes to changing working processes. The respondents explained that for any change to happen concerning processes, the employees own initiative is crucial. The own initiative can be

linked to taking ownership of a problem. With taking own initiative the person becomes the owner of the problem and thus becomes the solving responsible. This shows that it is possible to change processes but as long as no one is asking for a solution or owns the problem the processes will not be updated leading to repetitive problems and outcomes. *"Yeah, I have pushed this towards the management; this has not worked. So it is I that has been holding it together. It is not management that has tried to solve it themselves; it has been on my initiative'.*

5.7 The relation between line organisation, functions and projects

The projects are responsible to plan activities that need to be performed in order to meet the requirements for the change that needs to be done. There is a responsibility split between projects and line organisations. The projects are responsible to tell when and what needs to be done i.e. define and plan activities on project level. Line organisations are responsible to tell who and how it will be done. The knowledge specific domains are interdependent and need to cooperate to manage the changes needed. They need each other input to make their deliveries. The boundary between project and organisation is defined as a pragmatic boundary. This is the most complex boundary between two actors defined in the theoretical part of the paper. When discussing how working processes change is done in the organisation one of the respondents explains how major projects can change a process that later becomes a standard *'...the change happens when something goes wrong. Frequently in the major projects that are supposed to fined technical solutions and not organisational. So it is not more then the conches. Our process are not good we should maybe review them, it doesn't work like that, they just tell us we will do like this and then it becomes a standard procedure'* This statement shows the influence large projects have on the organisation. The respondents also show a perception on processes and their importance. If a process doesn't work then a workaround is welcomed instead of looking into why the process doesn't work and how can it be improved so that it can work. One interviewee explains *'This is it, either you sit and wait, telling that there isn't any process and of course it doesn't work. But with projects it doesn't matter. You have to coerce the project anyway. You will have to find workarounds or something. Because, you have to solve it in one way or the other'.* It shows that the project delivery is prioritized before reviewing the processes. The delivery of the project is of such importance that if it doesn't work in the current processes the project is free to create own processes. This would be good if after the project the processes would be updated and the new processes become

official but by then new project start to create their own way of working. This makes it very hard to control and to improve processes.

5.8 Dependability and Communication Process

Furthermore it can be seen that the respondents are divided when it comes to the questions if there is a clear process or a way to work with PPRs. The ones that are confident that there is a process are the ones that are responsible for the PPRs mainly SPM or people with past experience as SPM. However as the respondent is further from the owner of PPRs, the SPM, in project organisational chart the knowledge of how PPRs work diminishes. This shows that there is a lack in communication of the use and working process of the PPRs from SPM down in the project organisation. There is a detailed process on how to work with PPRs in the company. However the process is not known in detail by the people that give input to the PPRs. This shows a miscommunication from upper management when selling in the idea of PPRs. Also at every level in the project organisation the lessons learned get filtrated before passing it on to SPM.

Another aspect that was captured during the interviews is how communicative the PPRs are to the users. The respondents are divided when it comes to judging how easy it is to understand the PPRs contents. The pedagogic point, easy to read, easy to understand of the PPRs influence the way people learn, the amount of lessons they can absorb i.e. if they are not easy to understand the communication will fail leading to lessons learned not fully being transferred. The respondents point out that it is dependent on who writes the PPRs and how good one is in explaining end expressing oneself. Especially as the time to search and to read PPRs is very limited the effectiveness of the PPRs to communicate experiences becomes even more important. A respondent comment *"naturally it is up to the writer how well he is able to express himself"*. This is a risk. If the SPM does not put enough time to compose it in a good way the lessons learned might be wasted. Judged from the interviewees' answers there are no standardized ways or guidelines used on how to write lessons learned and what they should contain. There are templates mentioned in the interviews that are used to structure the lessons learned but these are insufficient to guide the writer. The respondents express a positive feeling of having the freedom to write about anything that they seem as a problem in the project. However they did not feel that there was a person or a group that help them to define

how and what the PPRs should be include. It is up to the SPM to decide. This can create diversity in quality and content of PPRs.

6. Discussion

The perceived attitude towards the PPRs is negative. The respondents felt that everybody could agree that it is important to learn from past experience and learn from other projects but they explained that the PPRs are not viewed as being capable to do this. Based on the results from the questions in table XY it is safe to say that the PPRs do not meet basic requirement according to Williams (2003).

PPRs and other documentation from past projects are stored for later use. Carlile (2002) defines storage space as *"act of adding to the existing knowledge stock in active use by an individual, group or organisation."* The PPRs are intended to be used in the given company for that reason as well but as results shown are less impressive. The lessons learned are stored in a system accessible to all but the process of finding the document is perceived as difficult. If the lessons learned are difficult to find the active usage of them as suggested by Carlile (2002) is limited. With post project reviews the organisation should identify and store the relevant key experience for upcoming projects. The identified key experience should be taken in to concern on a high strategic level for organisational development especially on how to run successful projects. Also it can be used to analyse how to cut time to market, save cost, increase quality assurance etc. However for this to work there has to be a feedback loop from project experiences into the working processes.

The evidence of organisational learning shortage is when similar mistakes pointed out in one project reappear in a subsequent project. This shows that the organisation has not evolved between the projects and thus the same level of knowledge is contained in the working methods i.e. no learning on organisational level. In most companies, as in the one researched, there is an ambition to learn from projects and reuse it in the subsequent projects. However, *'Too often, the lessons learned from failed projects are quickly swept aside, with little effort expanded to trying to discover the useful lessons that can be carried over to future efforts'* (Williams 2003:445). Organisational learning can be made possible by a process where working processes are updated relative to problems identified in a project. The ideal learning

organisations need to have feedback loops back to their processes to sustain learning (Hughes et al., 1996, Caffyn, 1997, Michael, 2004, Goffin et al. 2011). This means that in order for organisation to learn it is necessary for it to update or create new processes that solve a problem identified in a project so that the road blocks are taken care of for subsequent project. By updating a working process the company, the group and the individual will actively use past experience.

Knowledge can also be embedded in tasks, activities, routines or artefacts that can be retrieved for use in later stage. (Carlile, 2002) The lack of embedding knowledge, identified in projects, in tasks, activities, routines will influence the learning of the organisation negatively. This is proven by reappearing problems between subsequent projects that are illustrated in table X2. This is not unusual since; *'Business seems particular week on learning from projects, rarely exploring the reason for success or failure and rarely adapting management behaviour in the light of these lessons.'* (Williams 2003:443). The reappearing problems mean that mistakes are remade from the previous project and thus the experience was maybe documented but not actively used. If companies seek to learn from project it must use the experiences in the activities it performs. To understand the problem it is interesting to investigate what type of knowledge the projects are trying or failing to pass on. During the interviews the respondents identified that work processes related problems as reappearing problems in subsequent projects and that this is the most important lesson that needs to be passed on to next project. This proves together with analysis from PPRs that the softer knowledge how to set up effective meetings, how to forecast a budget, how to split work between different sights, how to secure resources, what to think of when starting the projects are omitted when knowledge is transferred between project and organisation working processes. The usage of databases *"are appropriate for capture of product knowledge, but not for capture of softer learning"* (Newell et al., 2006:176) softer learning being the tacit knowledge or novel knowledge created that is hard to transfer between knowledge specific domains. The use of PPRs is insufficient to capture this knowledge and the respondents use unofficial channels to learn from each other how to deal with soft knowhow. The respondents point out besides advantages with the ability to sit in work groups that have similar jobs and share the experiences that forums, meetings and experienced co-workers are preferred then using PPRs. Respondents point out that it is a lot more appreciated to talk personally to people then read documents from previous projects. They argue that meetings and forums

where knowledge is shared between projects on activities and how they did this and that is a lot more efficient.

This informal way of knowledge sharing is a way to go to share tacit knowledge but the process management needs to be incorporated as well. There has to be also a structured organisational learning were working methods are reviewed and updated accordingly. The personal sharing only works as long as people are working in the projects and in the company. This is a limited time in most cases thus this way of transferring only works for short term solutions. The long-term solution must include imbedding the knowledge into working routines because they are always present regardless is somebody leaves the company. Organisational learning to happen needs to be prioritised and managed from a top level so that the organisation as a unit has a strategy towards it will develop. Williams (2003) also argues that management must devote enough time and resources for employees to reflect on past experience to find relevant lessons that can be useful in future projects. Even though there is a positive effect for knowledge sharing when people are moved from one project to another the time to reflect over major events in a project and to learn from them is crucial. It is the time when the employees reflect on their experiences the tacit knowledge and soft knowhow can be shared. The root causes can be identified and proper measures can be made. The processes can be updated and solving responsible can be pointed out. Common knowledge and language along with dependencies and differences can be defined and adjusted between knowledge specific domains. This takes time and resources and as novelty increases the harder it gets. But, the payback is that with processes updated the projects will not make the same errors and the product development time can be optimized. However, Williams (2003) states that in most firms the project team members are swiftly rushed to next project leaving little time for reflection on what went wrong and what can be done to avoid it next time. Unfortunately this situation is also present in the researched organisation. There is simply no time between one project ending and the next starting for the project team to reflect on the major events and try to learn from them. The focus is on short-term delivery and profit jeopardizing the long-term organisational learning and project management development.

Process changes do happen in the organisation. But they are ad hoc and happen when things go wrong in a project. The organisation is forced into change. Often when major projects, which have to make large leap in technology in limited time frame, encounter friction within line organisation processes or activities the changes happens. Due to time limitation the

projects cannot accept the necessary lead times of development process. In this is a case one actor, the project; at a boundary has higher perceived power then the other, the line functions, which leads to re-usage of common language instead of adjusting common language and knowledge to novelty. In other words the project forces change on to the line organisation. The project deliverables are perceived as the highest priorities giving the project right to make short cuts, workarounds or make up new processes in the organisation. This can be explained instead of defining the root cause of the problem by identifying differences and dependencies between the project and the organisation the projects focused on delivery pushed on by upper management impose their way of working shortcutting the line organisations preferred working process.

To transfer knowledge such as lessons learned across boundaries in an organisation the knowledge must be perceived as useful to all actors involved, the relations and dependencies need to be understood as for why the different actors need to learn from each other to reach a goal, the willingness and trust between actors need to be at a level so that the absorptive capacity is sufficient to get the lesson across the boundary and applied in practice by e.g. process improvement. One respondent explains the situation *"One must take in to concern that there is a fight between projects and line organisations. Projects might feel that this is the way the line organisation should work, at the same time as the line organisation says no, no, no this is the way we will work and this is what we will deliver. It is always trade off and maybe the opinions might differ but we should realize that we need to find a solution.... some things get implemented and lessons are learned, but not all, not all the way and not in organized manner. It is often when things go really wrong, and you get heat from above, then we have to do something. We have to squeeze this in as well and deliver"*. The respondent's answer shows that there is a barrier between project and line organisation. However there seem to be no effective way to transfer lessons learned. There is no forum where knowledge barriers are analyzed and defined. Things have to get urgent for organisation to react on them as explained by the respondent. This puts the organisation in a reactive position when learning from projects. The changes are ad hoc and not organized leading to risk that they make more damage than good if not controlled. The line organisation and the projects have not defined sufficiently common knowledge and language to transfer the lessons learned which lead to a feeling that line organisation is overrun by the projects. This in turn leads to mistrust between line organisation and project management. The absorptive capacity seems to be love between projects and line organisation when it comes to soft skills.

The PPRs need further development. The most urgent issue is to find a way to store them in an easy to access way. The retrieval process of knowledge will be depended on the experience and knowledge of the individual and their needs (Carlile 2002). This is most relevant to the companies storage system as it is almost impossible to find them if you are not fully aware what you are looking for. After this the company should refresh the concept of PPRs. They should seek help and appoint somebody that works with these issues to improve the quality of them. Make them more pedagogic and easy to read. Also share and promote evidence of them working needs to be put forward in order to change the opinion of the usefulness of PPRs.

One should always remember that all the problems identified in PPRs are relative. Communication, processes, etc might have improved from catastrophic to really bad to bad over the time and the projects but as new people come into the project they find it hard in their frame of reference. There might be some improvements that have been made and the work is easier than before but still there are things that need to be improved. However there are still problems that are identified in every project and across a time span meaning that there has to be some change. The PPRs should not only be a reading for the PM team to try to snap up a lesson or two on how to run the projects. They can be used by upper management as guidance for a strategic development of the organisation and its competences. They can be a document that sets the change that needs to be done were time is devoted on teams are used with a mentor to reflect on what the major events were in a project and how they can be controlled. Then find root cause of the problems, a solution and implement it. The specific problems can be solved in a later stage but the general problems that are mentioned in every project must be possible to address on a very high level in the organisation and implement change.

This shows that even though PPRs do not capture the soft issues the informal communication between people in similar working situations contributes to that. But this has a great limitation dependent on how well you know people in the organisation, how you are as a person and how the people perceive you. The danger with leaving the learning process at that is that it will always relay on how good people are at net working. And when those employees that are well experienced switch to other positions or leave the company the risk that communication fails as the new employees do not have the informal ways to find information is eminent. The danger on leaving learning on personal bases is that the company becomes very vulnerable and exposed when people leave the company. They take their knowledge and knowhow with them. The new ones have to do same mistakes until they learn. To avoid this preferable way is

to save knowledge into processes and by doing so the company becomes less dependent on the individual performance.

Workarounds are welcome and seen as good personal ability as long as they deliver. This in turn gives the opportunity for people to develop their own ways of working and their own processes. This contributes in turn and is shown in the interviews the importance of individual performance and knowledge in projects. This shows together with people having to take workarounds to do their jobs that the processes that are in place now are not up to date and are not working. The organisation views the knowledge transfer with PPRs in use as a syntactic boundary that needs to be overcome. The PPR responsible composes the document it is stored in a system somewhat hard to find but accessible to everyone until next project starts. This would work if the differences and dependencies between actors are known and a common lexicon is shared. However as it is on each SPM to write the PPRs and there are only vague guidelines in form of templates leaving it up to the SPM to write how he/she seems fit the knowledge transfer will not be of a syntactic type. The PPRs are also written from a project to a project team and not to the organisation as a whole. The PPRs should be written to the organisation and be addressed by every group in line organisation to see how they can improve and what they can do better for the next project.

Due to the novelty generation associated with NPD projects it is more relevant to view the boundary between projects as semantic boundary. There needs to be a discussion where common meaning is developed. If one project discovers a way of working or solving an issue they need to review this with other projects and come to a common understanding and meaning to share the new knowledge. This can be done by having forums, meetings, formal or informal in nature but always present. The meetings would work very well for the parallel running projects but it should include all the PM so that they all get the new information and use it in upcoming projects.

However for organisation learning to really work the boundary that needs to be overcome is of pragmatic nature. As seen in the interviews and the analysis from the PPRs the problems that are always present are working process related problems. The project team and the organisation together with upper management must see a common interest in solving the problems described in the PPRs. For this to happen there needs to be a sustainable and significant political and practical effort. Without treating this problem the work process

related issues will be present in every project as they have been until today. The technological development will continue but the cost of it will also rise. The upper management together with line organisation needs to create an interest in sharing and assessing knowledge in all groups and use the PPRs as input for further improvement. Furthermore there should also be a long term development plan communicated to line organisation to become more proactive and less reactive in nature when it comes to organisational learning. With clearer engagement on these issues the absorptive capacity will also increase as the organisation will become better to recognise the value of new knowledge and become better to utilise it for commercial profit.

7. Conclusions

For project to be able to share knowledge with other projects and organisation there must be a process to capture and disseminate lessons learned; lessons learned need to be stored in easily accessible place, and evidence must be shown of capture and reuse of information on subsequent projects. The lessons learned from projects must be a source of input to process management that results in working process updates relative to lessons learned from projects. By doing so the lessons learned in one project will be actively used in subsequent projects thus the organisation has come to a higher knowledge level i.e. it is learning. Process management and organisational learning must be prioritized by upper management and have long-term strategic development plan with continues input from lessons learned from projects.

In the organisation studied, the formal way to transferring knowledge between projects is PPR. Today, the PPRs are written and then put into a storage system. This way to transfer knowledge would work well if the dependencies and differences between the sender and receiver are known and defined along with a common language. Furthermore there need to be a structured way to capture and disseminate lessons learned, they should be stored in easily accessible way and evidence must be presented for the process working. The PPRs are used in every project but the shared view by the project team members is not positive. They believe that PPRs to be inefficient and people do only what is expected of them when the PPRs are composed. They do not believe in them. However, they acknowledge that learning from past experience is important. The main reason for the miss belief and the low efficiency experienced is that the PPRs do not fulfil characteristics for how PPRs should be handled. In the given organisation they are hard to find, there is no clear ownership for implementation of

lesson learned and there is no proof that the lesson learned are used for improvements. This creates a *why bother* attitude in the project teams when it comes to writing PPR. Furthermore, the PPRs as a way to transfer knowledge work for transferring product knowledge, but not for softer skills. Lessons learned are closely related to the specific experience and are difficult to transfer other then with direct contact. A lot of respondents argue that they prefer direct contact then reading about it in PPRs and the reason for that is that they cannot extract the soft knowledge from the PPRs. Soft skills, how to manage budgets, how to start a project, how to create a team are highly relevant for project success in future and the organisation must find a way to better transfer them. The biggest gain is that the development time could be shorter if the processes are updated so that the same mistakes are not repeated. The softer knowledge should be transferred by mentors or forums. As the softer knowledge is easier transferred by interaction and social networking, one way to develop knowledge transfer could be by introducing mentors and other proven methods to facilitate softer knowledge transfer. The knowledge must also be looped back into the working process by mentors. By doing so the lessons learned get imbedded and used in the everyday work. In this way organisational learning can be achieved. The working processes become storage system for long-term knowledge storage. The PPRs can be a compliment and describe the context specific details in projects and a story about the projects along with product knowledge.

There are also a lot of informal ways that knowledge is transferred such as meetings, forums and clubs. Unfortunately these informal ways of transferring knowledge seem to be put in place when facing large problems that force the organisation to react. The meetings are sporadic and there is no strategy for them. Learning between parallel projects can be made possible with informal meetings, forums and interest clubs. For this to work effectively the forums must be defined on a general level, what type of forum it is, the intent and invite the people that are interested. To have this working effectively there has to be a mentor that helps to transfer tacit knowledge in these forums. Otherwise the informal ways will die out as soon as people move to other positions or a project ends. The project team argue that most knowledge sharing happens by interaction with people that have experience and by moving people between projects.

The reappearing lessons learned are mostly defined as softer skills such as project management skills and work process related. This shows that this type of knowledge does not get transferred. Working processes especially project management are defined as most wanted

lessons to be transferred but also these are the ones that are mostly repeated. This proves that there is a problem with organisational learning in the company that affect the project management organisation maturity negatively. The experience from previous projects concerning what works well and what does not work was not incorporated into the processes and is not actively used by individual, group or company. Thus the next project did not start from a higher knowledge level but it started in the best case from the same level and ended up doing the same mistakes as the previous one. Often when the reader of PPRs is aware of the problem it is too late to solve it as the project is already on-going and it needs to deliver. The respondents identify work process as reappearing problems in projects and the lack of work process knowledge transfer between projects. The repetition of problems is mainly due to that processes are not updated with feedback from lessons learned in projects. This in turn is not done because the responsibility and ownership of process updates is not defined in the organisation. There is no process after the PPRs are written that takes care of the lessons learned until the next project starts.

The knowledge transfer barrier is treated by the organisation as a syntactic boundary. The barrier that needs to be crossed is of different type. To loop back the lesson learned concerning the softer skills from the PPRs into the working processes the boundary must be recognised as a pragmatic boundary. An owner of the problem must be pointed out and the organisation must work to implement and follow up the lessons learned. This needs to be addressed adequately by upper management. This boundary requires significant practical and political effort thus cannot be solved without upper management involvement. Basically a common interest, between projects and line organisation, of knowledge transfer must be created in the organisation and process management prioritised. By having attention from upper management and people actively working and implementing improvements the trust in knowledge transfer will be gradually restored. The organisation needs to recognise the complexity of knowledge transfer. There is no easy way to transfer the knowledge without dedicating time and resources that actively work with knowledge transfer. The organisation uses a simplistic approach to knowledge transfer that only works for certain type of knowledge to be passed on to subsequent projects.

The learning policy needs to apply for everyone not just project teams. After every major project each line organisation group, function, community of practice should sum up the good and bad experiences and how they can improve. This should be the input for all organisational

development activities. They should use it as input to improve processes and work with line organisations to deal with misunderstandings in order to enhance cooperation and communication. Right now it is mostly the project teams that have to learn from previous projects. This should apply to all employees as projects success is vital for company survival.

However to get anything of this to work the upper management must get involved. The working processes are not to be left alone to be updated when things go wrong in major projects. The company must have a long-term strategy for organisational development and work actively with it. To get the knowledge transfer to work a detailed definition of dependencies and differences need to be in place and the upper management needs to find these issues interesting and devote resources and time. As long as employees feel that they have no time to do the necessary reflections and improvement due to the workload they will keep on pushing the cart with the square wheel regardless if they have a round one that could make their work easier.

Picture 2 Illustration of the problem with prioritisation: "Do not have time, have to work"
Source; the Author

The knowledge can be imbedded in the working processes and upper management can create a climate where these issues are important and seen as second to none for the long term improvement. The technical issues cannot always be prioritized.

8. Improvement

The PPRs should be written in a more pedagogic way so that they become utilized by all employees not just by the project teams. They are appropriate for transferring product knowledge however they fail to transfer the softer knowledge.

First, short-term improvement should be to find another system to store or to find lessons learned. The system used today is outdated and the respondents find it very hard to access PPRs that are relevant to their situation. Secondly, the attitude toward the PPRs and their importance, usage and contribution must be sold in to the organisation. The SPM and PM could hold presentations on success stories where they show how they have used past experience to perform better in next project. The whole idea of having PPRs must be marketed towards the organisation so that people start using them and believe in them. Success stories should be communicated to show the benefits of learning from past experience. For longer-term solution a dedicated resource that only works with process mapping and improvement. The mapping would primarily be to understand the whole process of the NPD organisations and find synergies and waste. The mapping should include a clear description of different roles and the input and output necessary at each function and a simplified visualisation of the whole process. After the process mapping is done there has to be implemented changes on how the PPRs are used after the project are closed. Right now they are only used as documentation of past experience but a feedback loop should be implemented where the lessons learned are transferred to process manager responsible to analyse problems, define root causes, define a countermeasure and implement it. Without a process mapping all the improvement of processes will not work because the processes are not defined throughout the whole development chain. Without a complete map it will be impossible to predict what effect a change will have.

The next step after mapping the processes and the responsibilities for each function a mentor role needs to be introduced in the company project management process. This role should carry the important responsibility of composing the PPRs for all projects. The role should be in the early phases of the project to set the structure from the beginning and also be present in the projects that are running in parallel to bridge between the projects. This is done in some

extent in the line organisations with experts but not in project management organisation. This should also be included in the NPD organisation as a complement to the SPM function.

One way to solve the lack of time would be by capturing this knowledge or lessons learned on a higher level, i.e. organisational learning. This can be done by updating processes with the new knowledge to make them work better. Then the individual learning from past experience will not be as important as the processes are the ones responsible to capture the knowledge. The individual can then rely on processes and working according to them being confident that he will not make the same mistake. However as it is shown this is not done in the company. This leads to repletion of unwanted outcomes and when this is prolonged the mistrust of knowledge transfer ability in the organization.

Last development leap would be to introduce System Dynamics. By working with System Dynamics insight in causality of project outcomes can be used to better understand the shortcomings and successes of a project and learn from them. It may make the transfer of lessons learned easier as well, because it gives a way to analyse the project outcome qualitatively and find out the cause of things that happened that can be described and transferred to next project or used to improve processes.

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Appendix A

Interview Protocol

The aim of this interview is to capture your views on organisation learning from projects. The questions are based on theory about organisational and project-to-project learning and the goal is to find out how to improve learning from projects. You have been selected as you have experience from project management and/or the organization. I will ask you sixteen questions about these topics and the interview will last for about one hour. All interviews will be recorded and transcribed but everything will be anonymous and no naming of the respondents or projects will be published in the report.

Interview questions:

1. How long experience do you have with projects?

2. Can please describe the role you had and the projects you were involved in briefly?

3. Are you familiar with any company policy that encourages learning from previous projects?

    a. Who is the target group?
    b. How are the project-to-project learning processes perceived by you and other users in the organisation? Do they feel that the process is working?

4. Is there a clear process or guidance how to document your experience from projects and are all welcome to share their experiences?

    a. Can you describe the process briefly

5. Do you find information from previous projects easily accessible? How do you get to this info?

6. Do you ask for information or documents from your colleges from previous projects that they have been involved with?

    a. If so what do they contain and do you find it usable for your work?

7. Do you find the information easy to understand and/or put it into the context?

8. Do you believe that it is possible to reuse experiences from other people in other projects and apply that in your projects?

9. Can you give an example of a lesson learned or recommendation that you found documented or acquired in other way from previous project that you used in the subsequent project?

    a. A very good experience
    b. A very bad one
    c. Why were these lessons important to you?

If answer is no:

    d. If you have not used any documented experiences from previous project why is that?

10. Do you miss any type of knowledge sharing in the organization between the projects?

    a. If yes, what type of knowledge are you missing in PPRs
    b. Is there good process/way in the company to share that type of knowledge, why?

11. What do you feel is the most important lessons learned/knowledge that should be passed on to next projects and how?

12. What is done with the recommendations and lessons learned after a project is finished?

13. Do you feel that there is enough attention on the lessons learned or problems identified form top/line management that are resulting from NPD projects?

14. Have there been problems in previous projects that have not been treated by the organization resulting in same problems occurring in next project?

15. If this is true what type of problems are repeated from projects to project?

16. If the mistakes are repeated why is that the case and how can it be avoided?

17. Are there other ways to share lessons learned between projects that you use or know of in the organisation and could you please give example and explain how they work?

    a. Ex. Do you have mentors that you talk to?

    b. Are there discussion groups where you can share your experiences?

Thank you for devoting your time and participating in this study. It is greatly appreciated and your views will give more insight in the problem and the solution of the topic.

Date of interview:

Interview 1 (8 March 2011)

Interview 2 (8 March 2011)

Interview 3 (10 March 2011)

Interview 4 (14 March 2011)

Interview 5 (14 March 2011)

Interview 6 (15 March 2011)

Interview 7 (21 March 2011)

Interview 8 (21 March 2011)

Interview 9 (22 March 2011)

Interview 10 (23 March 2011)