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# An Efficiency Improvement of a Product Development Process Through the Project Management Activities

A Case Study at a Swedish Multinational Corporation's  
R&D Department

*Master of Science Thesis in the Master's Programme International Project  
Management*

**CHRISTIAN GIDEBRING**

Department of Civil and Environmental Engineering  
CHALMERS UNIVERSITY OF TECHNOLOGY  
Göteborg, Sweden 2016  
Master's Thesis BOMX02-16-56



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Examensarbete / Institutionen för bygg- och miljöteknik,  
Chalmers tekniska högskola BOMX02-16-56

Department of Civil and Environmental Engineering

Chalmers University of Technology

SE-412 96 Göteborg

Sweden

Telephone: + 46 (0)31-772 1000

Department of Civil and Environmental Engineering Göteborg, Sweden 2016



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# Structured Abstract

**Introduction:** It is essential not to ignore that the world is continuously changing. Hence, it is vital that organisations also alter, and adopt new ways to manage this constant evolving environment in order not to fall behind competition. One way to achieve this is by executing efficient product development (PD) projects. However, there are studies today showing that a third of all PD projects performed nowadays fail.

**Aim:** This research aims to explore how an MNC could increase the efficiency of their product development process through enhancing the project management activities. For this purpose, the research identifies the factors, and their attached issues, that constitute the knowledge areas within project management. Further, the research will also examine how these potential issues could be solved.

**Theory:** There are three main theoretical frameworks used in this study: Project Management, Organisational Efficiency, and Product Development. Further, the purpose of these is to create the foundation for the discussion of the findings generated in this research.

**Method:** The method used to perform this investigation is a case study executed at a Swedish MNC. Moreover, a qualitative approach was adopted and the data were collected mainly by conducting semi-structured interviews with case company employees.

**Results:** The study disclosed that there are several issues connected to the project management practices. For example, the MNC has poor communication methods, the projects spend too much time on the process of bargain for resources from the line organisation, the top management strategies are not as well-defined as they need to be, which creates poorly defined project scopes and changes to the project scope. Besides, the MNC also spends a lot of time on their local request process.

**Conclusion:** The main problem areas in a product development process with regards to project management are: *Communication, Scope, Time, and Human Resource*. Nevertheless, the study also reveals that there are methods on how to deal with these issues. One solution could be to implement a *lean mindset* into product development project management activities.

**Keywords:** Project Management, Product Development, Communication, Organisational Efficiency, Lean Management, Six Sigma



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Christian Gidebring

Gothenburg, Sweden, May 2016



# Table of Contents

1. INTRODUCTION	1
1.1 Theoretical Rationale & Justification	1
1.2 Practice-Based Rationale & Justification	2
1.3 Research Aim	2
1.4 Scope and Limitations	3
1.5 Ethical Considerations	3
1.6 Thesis Outline	4
2. THEORETICAL FRAMEWORK	5
2.1 Project Management	5
2.1.1 Communication	7
2.2 Organisational Efficiency	9
2.2.1 Toyota Production System – The Toyota Way	9
2.2.2 Lean Management	11
2.2.3 Six Sigma	13
2.3 Product Development	15
2.3.1 Efficiency of Product Development Projects	17
2.3.2 Lean Product Development	17
3. METHODOLOGY	19
3.1 Research Approach	19
3.2 Research Design	19
3.3 Data Collection Methods	20
3.3.1 Interviews	20
3.3.2 Observation	21
3.3.3 Secondary Data	21
3.4 Data Analysis	21
3.5 Data Validation	21
3.6 Research Method	22
4. CASE COMPANY	24
5. EMPIRICAL FINDINGS	26

5.1	First-Round of Interviews - Understanding the Challenges	26
5.1.1	Initiation	26
5.1.2	Planning	27
5.1.3	Execution	29
5.1.4	Monitoring and Control	31
5.2	Summary of Initial Analysis	33
5.3	Second-Round of Interviews – The Focus Problems	35
5.3.1	The Issues with the Local Request Process	35
5.3.2	Interaction between Project Managers and Project Coordinators	36
6.	DISCUSSION	37
6.1	Arising Findings	37
6.2	Recommendations for Improving the Efficiency	38
6.3	The Implications of the Research	39
7.	CONCLUSIONS	41
7.1	Recommendations for Future Research	41
	LIST OF REFERENCES	43

<i>Appendix 1</i>	<i>Interview Guide – Design Concept Leader (DCL)</i>
<i>Appendix 2</i>	<i>Interview Guide – Group Design Leader (GDL)</i>
<i>Appendix 3</i>	<i>Interview Guide – Unit Project Leader (UPL)</i>
<i>Appendix 4</i>	<i>Interview Guide – System Program Leader (SPL)</i>
<i>Appendix 5</i>	<i>Interview Guide – GDL Round Two</i>
<i>Appendix 6</i>	<i>Interview Guide – UPL Round Two</i>

# List of Illustrations

<i>Figure 2.1 Project Management Process (PMBok, 2005)</i> .....	7
<i>Figure 2.2 Conventional Communication Model (Zhong and Low, 2009)</i> .....	8
<i>Figure 2.3 The DMAIC Process (Magnusson et al., 2003)</i> .....	14
<i>Figure 2.4 The Six Sigma Toolbox (Magnusson et al., 2003)</i> .....	15
<i>Figure 2.5 The Product Development Process (adapted from Vielhaber and Stoffels, 2014)</i> .....	16
<i>Figure 3.1 Applied Research Method</i> .....	23
<i>Figure 4.1 The Case Company's Organisational Structure</i> .....	24
<i>Figure 4.2 Case Company Phases and Gates</i> .....	25

# List of Tables

<i>Table 2.1 Lean Principles in Production and Engineering (Tyagi et al., 2015)</i> .....	18
<i>Table 5.1 The Identified Issues</i> .....	34



# Preface

This master dissertation is a Dual Award project in M.Sc. in Project Management from Northumbria University in Newcastle upon Tyne (United Kingdom) as well as International Project Management from Chalmers University of Technology in Gothenburg (Sweden).

The research was inspired by the necessity of revealing how a multinational corporation (MNC) could increase the efficiency of their product development process through enhancing the project management activities as well as identifying the issues connected to project management in such an environment.

This research is established on a qualitative approach and the data collection method where mainly the researcher conducting eleven semi-structured interviews with employees in a case company.

The scope of the study is to focus on project managers (PM) and project coordinators in one particular Swedish MNC's Research and Development department. Furthermore, the scope also limited the research to focus only on the activities performed between the case company gates PS (Program Start), and the PA (Program Approval).

## List of Abbreviations

<b>Term</b>	<b>Definition</b>
AE	Advance Engineering
BNVA	Business Non-Value-Added
DCL	Design Concept Leader
DMAIC	Define, Measure, Analyse, Improve and Control
GDL	Group Design Leader
JIT	Just-In-Time
ICB	IPMA Competence Baseline
IPMA	International Project Management Association
ISO	International Organisation for Standardisation
LEQM	Planning tool used by the case company
LPD	Lean Product Development
MIT	Massachusetts Institute of Technology
MNC	Multinational Corporation
NVA	Non-Value-Added
PA	Program Approval
PD	Product Development
PM	Project Management
PMBok	Project Management Body of Knowledge
PMI	Project Management Institute
PMP	Project Management Process
PS	Program Start
PSR	Project status report tool used by case company
R&D	Research & Development
SEK	Swedish crowns
SPL	System Project Leader
TPS	Toyota Production System
TSU/POB test objects	A document used by the case company to buy
UPL	Unit Project Leader
VA	Value-Added
VSM	Value Stream Mapping
WBS	Work Breakdown Structure
ÄT	Project with only minor content

## **Glossary**

Lotus Notes

Software system used by the case company to store information and knowledge

SharePoint

Software system used by the case company to store information and knowledge







# 1. Introduction

## 1.1 Theoretical Rationale & Justification

Five hundred years before the birth of Christ, Herakleitos, a Greek philosopher noted that everything is in a constant change. He explained that one never descends into the same river twice but that the water is constantly flowing by. He also stated that the only true reality is the one that is changing. (Angelöw, 2010)

This state of an endlessly altering environment creates an *“intense competitive pressure in the global technology market as customers increasingly demand high-quality products at lower costs”* (Iamratanakul et al., 2014 p. 602). Hence, in order for companies to compete and survive in this ever-changing environment, both in the long-term and the short-term, they need to put heavy emphasis on their effort to increase their companies’ productivity and efficiency (Atmaca and Girenes, 2013), as well as introducing newer and more innovative products or services. Thus, there is the need for an effective product development (PD) (Letens, 2011).

The necessity to foster practices and principles that increase the efficiency and effectiveness of PD has been researched from various backgrounds in the last 20 years according to León and Farris (2011). One method that has become a powerful instrument to generate new products is project management (PM) (Iamratanakul et al., 2014).

*“So today one of the most important competitive advantages of organizations is efficiency in PM”* (Arabzad and Shirouyehzad, 2012 p. 607). Further, according to Smith (2008), Cullen and Parker (2015) projects are also one of the most forceful ways to accomplish a higher efficiency, process changes and stronger performance within organisations. Nevertheless, the traditional project management approach has recently been criticised by authors saying, *“that this stresses predictability, which in turn places an overemphasis on planning, design and development, and is ineffective for managing projects which entail high levels of complexity and uncertainty”* (Cullen and Parker, 2015 p. 610).

However, what is Project Management? PM is one of the oldest professions in the world. It is ancient project managers who created wonders such as the Great Wall of China, the Pyramids of Egypt and prehistoric cities (Smith, 2008; Seymour and Hussein, 2014; Raheem et al., 2012). PM has been defined in several different ways, but a definition used by the Project Management Institute (PMI) is the following (Smith, 2008 p.3):

The art of directing and coordinating human and material resources through the life of a project by using modern management techniques to achieve predetermined goals of scope, cost, time, quality and participant satisfaction

Nevertheless, how could one streamline one’s product development projects? A possible approach to achieve this is by implementing a Lean Product Development (LPD) (Letens, 2011; León and Farris, 2011). LPD emerged from lean production and the Japanese car company Toyota’s Production System (Gremyr and Fouquet, 2012). The concept of lean production enables organisations to direct their focus on the

necessary fundamentals of a specific process, and therefore create an enhanced value for the clients and customers (Khurum, 2014). This is achieved by directing focus to *”specify value, line up value-creating actions in the best sequence, conduct these activities without interruption whenever someone requests them, and perform them more and more effectively”* (Womack and Jones, 2003 in Khurum, 2014 p. 1074).

## **1.2 Practice-Based Rationale & Justification**

Even though there is a valid approach in order for organisations to rationalise and improve their product development projects, issues are emerging from these types of projects. A survey made by the Standish Group on software product development projects, 250 000 in total, revealed that *“only 28% succeeded, while 23% failed and 49% were “challenged,” meaning they were either late, over budget, or had fewer features or functions than originally specified”* (Lévárdy and Browning, 2009 p. 600). Although, this research is not focused on software the survey indicates that there are, in fact, problems in running product development projects.

Furthermore, according to Arabzad and Shirouyehzad (2012), there are studies showing that 30% of all projects performed, independently of the kinds of undertakings, have been stopped after completing only half of the project. Half of these projects have either been delayed by 220% or exceeded budget by almost 190%. It is also not uncommon to both exceed the budget and the timeframe simultaneously.

What could the above let-downs be due to? A survey made on industrial companies in the Western countries revealed that only 21,25% of their time is spent on performing activities that creates value for the customer, which equals 1.7 hours per workday (8 hours). Thus, the needs for organisations to minimise and reduce the waste so that, they increase their efficiency in order to perform better than their competitors. (Tyagi et al., 2015)

## **1.3 Research Aim**

The aim of this research is to explore how a multinational corporation (MNC) could increase the efficiency of their product development process through enhancing the project management activities. For this purpose, the research identified the factors, and their attached issues, that constitute the knowledge areas within project management. Further, the research also examined how these potential issues could be solved.

To achieve the above objective, the following research questions have been considered:

- What factors are key areas of knowledge within project management according to PM standards?
- What are the issues connected to these factors today?
- What solutions could be implemented to solve these emerging issues?



## 1.4 Scope and Limitations

This research aims to focus on project managers (PM) and project coordinators in one particular Swedish MNC's Research and Development department. The research lasted between the beginning of January to the end of May 2016. The study was conducted on a full-time basis during this period. The research sample could have been greater if more time had been available. Further, another additional limitation was that the researcher only study one single firm.

The data forming the basis for this research were gathered by conducting semi-structured interviews with the PMs as well as the project coordinators and by conducting a thorough analysis of the company's documents regarding their PMP. This is to create the clearest possible image of where in the process you may encounter activities that do not generate any project value.

For the purpose to have the best possible opportunity to understand and improve the PD process, during this limited time frame, the researcher choose to focus on the activities performed from when the project plan, the PS (Program Start) gate, is created to the PA gate (Program Approval), see chapter 4 for a explanation how the gates are connected.

## 1.5 Ethical Considerations

The ethical considerations are something that the researcher has invested a lot of time and effort into in order for the study to become as reliable and realistic as thinkable. "*Ethics begins and ends with you, the researcher*" (Neuman, 2011 p. 143 in Khan, 2014 p. 306).

Moreover, for the purpose to not cause any problems for the interviewees, and to make sure that they can talk as openly and honestly as possible, they were assigned anonymity in the study. They were also informed that they could end the interview or skip answering a specific question at any time during the interview if they feel uncomfortable. The interviewees were all given a general name, which cannot be connected with them. All retrieved data were stored in a safe place where no unauthorized people would have been able to access it.

## 1.6 Thesis Outline

### **CHAPTER 1 Introduction**

This chapter presents an introduction to the research, the research aim and questions, scope and limitations as well as ethical considerations

### **CHAPTER 2 Theoretical Framework**

The theories and literature used in the research is accessible in this chapter

### **CHAPTER 3 Methodology**

The methodology applied in the research is presented here

### **CHAPTER 4 Case Study**

A brief presentation of the case company

### **CHAPTER 5 Empirical Findings**

The findings collected at the case company are offered in this chapter

### **CHAPTER 6 Discussion**

This chapter presents a discussion based on the findings, the applied method etc.

### **CHAPTER 7 Conclusions**

A summary of the drawn conclusions from this research project

## 2. Theoretical Framework

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*This chapter provides the relevant literature review, which the analysis of this research will rely on. The Theoretical Framework chapter presents the following three main sections: Project Management, Organisational Efficiency, and Product Development.*

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### 2.1 Project Management

A project is a temporary organisation, and endeavour, constructed to manage an uncertain and unique change process by delivering clearly specified benefits to the project's stakeholders (Maylor, 2010). According to Kerzner (2003 in Raheem et al., 2012 p. 2), a project is *“an assignment that has to be undertaken and completed within a set time, budget, resources and performance specification designed to meet the needs of stakeholders and beneficiaries.”*

Furthermore, a description of the *“series of processes and knowledge areas generally accepted as best practice in project management”* (Abdul Rasid et al., 2014 p. 265) are often referred to as project management body of knowledge. There are a few different bodies of knowledge found in the current literature. However, some of the most well-known are: Project Management Body of Knowledge (PMBoK), the IPMA Competence Baseline (ICB), PRINCE2 (Sanjuan and Froese, 2013), and ISO 21500 (Grau, 2013). These standards are usually implemented in organisations to provide support in how to work with methods and processes. They also provide an encouragement to create a trust band between one's own organisations, its suppliers and its customers when collaborating with one and other (Grau, 2013).

#### 2.1.1 ISO 21500

ISO 21500 is an international standard generated by the International Organization for Standardization (ISO) with the support and backing of officials from a variety of nations. According to Grau (2013, p. 14), the goal and aim of this standard is to exist as *“a general, overarching standard to give guidance. It will be the basis for developing a series of new national and international standards for project, program and portfolio management”*. The reason way this standard is so general is because the applicability of the standard increases and one could use it on many various styles of projects as well as on projects with different levels of complexity and dimensions. The different knowledge areas found in ISO 21500 are the same as the ones found in PMBoK.

#### 2.1.2 IPMA Competence Baseline (ICB)

The International Project Management Association (IPMA), established in 1965, once known as INTERNET was created as a forum for practitioners in Europe where they could share ideas, knowledge and their experience in the area of project management (Crawford, 2013).

Their project guideline, called IPMA Competence Baseline (ICB), consists of three various groups, each containing a couple of different knowledge areas. The following groups are presented with an example of some of knowledge areas in every group (Sanjuan and Froese, 2013):

- *Technical* – PM processes or knowledge-based
- *Behavioural* – Result oriented, Leadership and Efficiency
- *Contextual* – Products, Legal, Finance and Technology

### **2.1.3 PRINCE2**

The Office of Government Commerce UK developed and designed the PRINCE2. This methodology is the outcome of the collected experience from failed and successful projects. The different elements found in PRINCE2 are similar to the ones found in the PMBoK. (Sanjuan and Froese, 2013)

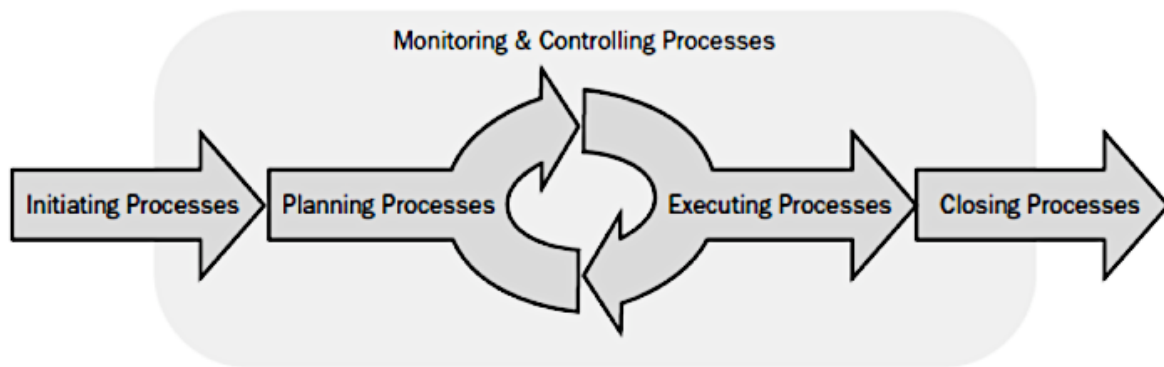
### **2.1.4 Project Management Body of Knowledge (PMBoK)**

A Guide to the Project Management Body of Knowledge (PMBoK) is one of the more common bodies of knowledge. It was created by the Project Management Institute (PMI) (Abdul Rasid et al., 2014). PMI was established in 1969 in North America with the sole purpose to create *“an opportunity for professionals to meet and exchange ideas, problems and concerns with regard to project management, regardless of the particular area of society in which managers function”* (Crawford, 2013 p. 4).

The PMBoK disclosed ten different areas of knowledge that are important to master as a project manager. The identified areas are as follows (Abdul Rasid et al., 2014; Sanjuan and Froese, 2013):

- Risk
- Procurement
- Communication
- Human Resource
- Quality
- Cost
- Time
- Scope
- Integration
- Stakeholder

The project management process found in the PMBoK is designed in the subsequent sub processes 1) *Initiating*, 2) *Planning*, 3) *Executing*, 4) *Monitoring and Control*, and 5) *Close* (Sánchez et al., 2013).



**FIGURE 2.1** PROJECT MANAGEMENT PROCESS (PMBOK, 2005)

The work that is needed to be executed in the various sub processes of the project is as follows: In the *initiation* it is important to identify the relevant stakeholders, create the objectives and to make sure that the scope is right and fitting for the project. (Sánchez et al., 2013)

In the next sub process, *planning*, is it vital to manage the following tasks. Generate a WBS (Work Breakdown Structure), create the project plan as well as scope planning, define all the activities, start the groundwork of budget costs, and produce a plan for the communication and risk activities to name a few of the actions needed to be performed during this sub process. (ibid, 2013)

During the *execution* sub process of the project the team needs to be established, and information must be distributed. It is also important that the expectations of the stakeholders are managed properly and the vendors selected. (ibid, 2013)

In the *monitoring and control* sub process the following tasks, naming only some of them, are vital to perform: Verification of the scope, control the scope and the schedule as well as the cost, lead the project members and manage them in a proper way, and report the progress and performance of the project. (ibid, 2013)

Finally, in the *closing* sub process, all contracts have to be closed and the project will be terminated (ibid, 2013).

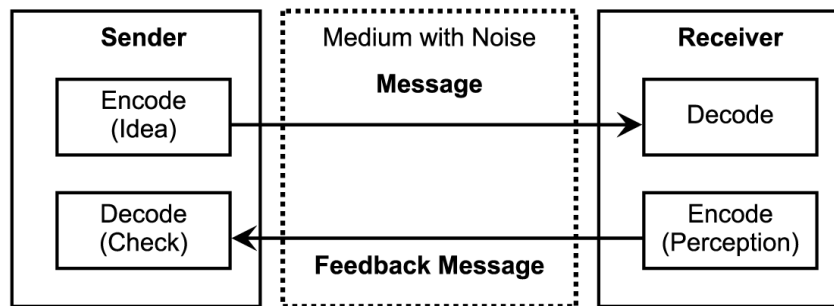
One of the important knowledge areas of project management presented in the PMBoK is communication. The following section offers a knowledge base that will enrich the reader's understanding of communication.

### **2.1.5 Communication**

The Latin word *communicare* form the basis of today's term communication, and means "to make common". The essence is that two or more individuals create a shared understanding of a given idea (Zulch, 2014). One definition of communication reads: "*the transmission of meaning from one person to another or many people, whether verbally or non-verbally*" (ibid, 2014 p. 1001). There are different types of communication, for example (Zulch, 2014):

- *Electronic communication* – This might be e.g. emails, fax machines.
- *Visual communication* – This could for example be videos or presentations.
- *Written communication* – Reports from meetings, letters etc.

- *Oral communication* – Interviews, discussions, meetings etc.
- *Non-verbal communication* – gestures made by a person e.g. a smile.



**FIGURE 2.2** CONVENTIONAL COMMUNICATION MODEL (ZHONG AND LOW, 2009)

The process of communication works like this; the sender sends a message to a receiver, who decodes the message, and then sends a feedback message back to the original sender (Zhong and Low, 2009; Shannon, 2001). The above figure explains this process. “The success of communication mainly depends on the sender’s ability to speak, write, reason and listen competently” (Zulch, 2014 p. 1001).

However, one essential part of communication is the feedback message from the receiver, because it is this message that defines and clarifies if the receiver has interpreted the sender’s message, and the encoded idea, in the same way as the sender. If the sender’s communication has been efficient enough, then the receiver will have the same understanding of the idea. (Zulch, 2014) ”Without a complete feedback mechanism, the challenges and issues of a project are unlikely to be uncovered and could lead to unexpected and difficult to manage complications for the project” (Cervone, 2014 p. 75).

However, if the sender’s communication is ineffective, this could lead to misinterpretations from the receiver’s side, which in a project could lead, for example, to conflicts with stakeholders, suppliers etc. If a receiver, e.g. project stakeholder, misunderstands the information communicated by a sender this might impact the performance of a particular activity, and might in the worst-case lead to project failure. Three different ways to manage the communication can be to: 1) Schedule for planned meetings, 2) make sure that everyone in the team receives reports, and that 3) the reports are distributed to all of the team members. (Zulch, 2014)

Some of the issues connected with a poor project communication are that the project (Cervone, 2014):

- Does not meet the different the needs of the various stakeholders
- Assumes that all of the stakeholders have the same commitment to the project
- Discards the differences applicable to people from different cultures
- Uses the same communication method throughout the whole project, and not changing communication methods according to the needs of the specific project phase

Therefore is it, as a project manager, vital to keep this in mind throughout the whole completion of a project.

## 2.2 Organisational Efficiency

When defining the performance of an organisation's process, a frequently used term is efficiency. Efficiency is measuring how good an organisation is at realising the agreed outputs with the smallest amount of input in a chosen process. The phrase "doing things right" is often used to explain efficiency. (Coenen et al., 2011)

The formula presented below by Billyard and Donohue (2014 p. 4) explains how to calculate organisational efficiency:

$$\eta = \frac{\text{Resources generating outputs}}{\text{Total resources}} = \frac{C_{P|O} + C_{B|O} + C_{E|O}}{C_P + C_B + C_E},$$

The numerator row represents the unambiguously generating outputs related to personnel ( $C_{P|O}$ ), building ( $C_{B|O}$ ) and equipment cost ( $C_{E|O}$ ). The denominator row represents the total resources expended by a group related to personnel ( $C_P$ ), building ( $C_B$ ) and equipment cost ( $C_E$ ). (Billyard and Donohue, 2014)

Further, in order for companies to reach a higher efficiency in their PD processes they often either look to process improvements methodologies such as Six Sigma (Parast, 2011) or Lean (Suetina et al., 2014). However, these methodologies have been found to be more powerful when combined because lean focuses on speed whilst six sigma focuses on quality (Atmaca and Girenes, 2013).

### 2.2.1 Toyota Production System – The Toyota Way

Liker (2004) identified, at Toyota, fourteen different principles, which together creates the foundation of the Toyota Production System (TPS) and the basis of the lean concept. These principles are:

(1) *Base the decisions on long-term thinking, even though it might have a negative impact on the short-term financial objectives.* The idea with this principle is almost philosophical and challenges one's perceptions of how to think rather than act. It transmits the message that it is better to have a company focus that supports the employees, society, customers and organisation in the long run even if these decisions and actions are not aligned with the short-term goals. (ibid, 2004)

(2) *Create continuous process flows that bring up the issues to the surface.* Toyota is convinced that the right process will achieve the right outcome. The right processes will lead to products of higher quality and shorter lead-times. It is also important to challenge the processes in order to uncover inefficiencies and issues. (ibid, 2004)

(3) *Let the demand steer in order to avoid overproduction.* The idea is that you should balance your production on the customer demands. You should not produce more than necessary because inventory ties up capital and create slower processes. It can also mean producing goods that are not what the customers want. (ibid, 2004)

(4) *Even out the workload (heijunka).* One way to achieve this could be to hoard a lot of sales orders and distribute the production of them throughout the whole week. This approach is used to converge to a single piece flow. (ibid, 2004)

(5) *If necessary, stop the process to fix the issues in order to get it right from the start.* This principle explains that it is more vital to fix problems right away then waiting to solve them later because the same issues will most likely emerge again. At Toyota they have built in quality checkers in to their processes in order to detect quality

problems directly when they appear, and therefore, be able to fix these immediately and getting it right from the beginning. (ibid, 2004)

(6) *Add standardised way of working as a foundation for continues improvements and staff participation.* Henry Ford (Liker, 2004 p. 177) once said:

Today's standardised way of working is the necessary foundation on which future improvements will rest. If you think of "standardisation" as the best you know today, but which will be even better tomorrow - then you will go somewhere. However, if you think of standardisation as something that limits, then the progress will cease

(7) *Use visual control so no issues remain hidden.* The reason to use visual control is because it makes it much easier for the employees to recognise if they work according to the standard or not. It also supports the pull system and process flows. Furthermore, another idea is to make the reports as short as possible, if achievable use only one paper, this will then increase the visualisation of the report. (ibid, 2004)

(8) *Use only reliable, thoroughly tested technology that supports staff and processes.* This does not imply that you should replace the staff with technology, the base and foundation in the process should still be the employees, and the technology should only, like mentioned, support the staff in their daily work. However, the new technology shall not disrupt the processes' predictability, stability, reliability and most importantly that it fit with your company culture. (ibid, 2004)

(9) *Develop leaders who truly understand the work, live the Toyota philosophy and teach it to others.* This principle describes how leaders should act and think according to Toyota. Their leaders should possess great leadership traits and be company role models, with good knowledge about their business models and philosophy. Furthermore, Toyota lives by the notion that it is better to promote staff from within the company than hiring externally, because it is more likely that these understand and breath the corporate philosophy and values. (ibid, 2004)

(10) *Develop exceptional people and teams who follow the company's philosophy.* At Toyota, it is important to constantly work to strengthen the corporate culture and to teach employees how to work together in effective and high performing teams. (ibid, 2004)

(11) *Respect the extended network of partners and suppliers by challenging them and helping them become better.* If you challenge your network of suppliers and partners by helping them to develop and grow, they will sense that your company values them. You shall also address and treat them with the utmost respect, as they are a prolongation of your operations and business. (ibid, 2004)

(12) *Go and see with your own eyes to truly understand the situation (genchi genbutsu).* Do not, only take decisions on what data and others have said but go to the source to understand the problem yourself. Important, this principle applies to all the managers within the organisation, regardless of their hierarchical position. (ibid, 2004)

(13) *Take decisions slowly and in consensus, carefully consider all the alternatives, and then execute rapidly.* It is important to spend time discussing in which direction you want to go, however, once you have decided the path it is important to implement it quickly. (ibid, 2004)



(14) *Become a learning organisation through relentless reflection (hansei) and continuously improve (kaizen)*. Update your standards of what is currently the “best practice” in order to avoid having to reinvent the wheel repeatedly. This creates the foundation of becoming a learning organisation. Further, learn from your mistakes and issues by constantly reflect upon them. (ibid, 2004)

## **2.2.2 Lean Management**

The term Lean was first introduced in 1988 when John Krafcik, a researcher from MIT, wrote the article *Triumph Of The Lean Production System*. However, it was not until Womack, Jones and Roos authored the blockbuster *The Machine that Changed the World* who the world’s spotlight was directed towards this concept. (Ahlstrom, 2004)

### **2.2.2.1 Lean Thinking**

The idea of lean thinking is to identify waste, in Japanese known as *muda*, and to manage this waste in the best possible way by focusing on 1) specifying the value, 2) identifying the value stream, 3) the flow, 4) the pull and 5) the perfection. These five areas are described in more detail beneath. According to Womack and Jones (2003 p. 15):

Lean thinking is *lean* because it provides a way to do more and more with less and less – less human effort, less equipment, less time, and less space – while coming closer and closer to providing customers with exactly what they want

However, in order to reduce waste, there are seven different non-value-added (NVA) activities acknowledged. According to Hicks (2007) these are:

- Overproduction
- Waiting
- Transport
- Extra processing
- Inventory
- Motion
- Defects

Womack and Jones (in Hicks, 2007) have also uncovered an eighth source of waste, which is not utilising the knowledge imbedded in the organisation’s employees.

#### **2.2.2.1.1 Value**

According to Womack and Jones (2003), value needs to be defined by assessing the whole product, from start to finish. For example, they provide an example, in their bestseller *LEAN THINKING: Banish Waste and Create Wealth in Your Corporation*, of a trip where the total travelling time is thirteen hours. However, only seven hours of these thirteen were dedicated to travelling, and the rest of the time on waiting or queuing. The whole trip included activities such as booking the plane tickets, wait in the check-in line and in the line to the security, travel to the destination country, wait for the luggage and go by bus to the final destination. This were a few examples of the 26 different activities the travellers had to go through in order to reach their final destination. The conclusion of this story, according to Womack and Jones (2003), are that too many firms are included and that these firms are so concentrated in improving

their internal efficiency that they forget to see the efficiency of the whole supply chain.

Furthermore, in order to specify and define the real value of a product or a service, one must define what a product would actually cost if all the waste in the production process was removed and eliminated, a cost known as the target cost. When the target cost is established, this could be the baseline from which one could assess all the activities in the value stream, and evaluate if these steps add genuine value to the product. (ibid, 2003)

#### **2.2.2.1.2 The Value Stream**

The value stream is the set of activities that are necessary to be produced in order to generate a product or service (ibid, 2003).

Value Stream Mapping (VSM) is a method used, quite frequently today, in businesses to identify how the value flows through the companies' processes (Bevilacqua et al., 2008) The idea is to create a visual image of the process where the utilisation of time, number of resources and duration time is collected in every activity of the process (Tyagi et al., 2015). However, this method is also used in order to identify waste in the processes, and how to manage this waste by either reducing or eliminating it completely (Hines and Rich, 1997). VSM allows a corporation to identify bottlenecks in their processes and to take a more holistic, panoramic, view of the whole process. The idea of implementing such mapping is to be able to reduce inventories and decrease lead times. (Khurum, 2014)

In VSM, activities are classified in three different types of categories (George et al., 2005):

- *Value-Added (VA)* – Fundamental in order to deliver any product/service.
- *Business Non-Value-Added (BNVA)* – Does not add value to the product/service but essential in order to perform VA activities.
- *Waste or Non-Value-Added (NVA)* – Creates no value for the customer and are not required in order to execute VA activities.

#### **2.2.2.1.3 Flow**

Womack and Jones (2003 p. 22) explain that organisations need to reconsider how they think about, and act towards, flow. They state that the most common way of thinking and acting is that we try to do everything in batches. To repeat, an easy task over and over again, generating a great amount of inventory of that product, before we start with the next activity.

But we all need to fight departmentalised, batch thinking because tasks can almost always be accomplished much more efficiently and accurately when the products is worked on continuously from raw material to finished goods

Henry Ford was one of the first to adopt this idea of a continuous flow. He tried to create a continuous flow, from the raw material and the entire way throughout the production to finished vehicles, by rearranging the sequence in, which the activities were performed. (ibid, 2003)

According to Womack and Jones (2003), we need to eliminate all the queues and all the waiting in order to create a continuous flow of the products. A method used in

order to achieve a continuous flow is to implement the idea of takt time. Takt time is the pace that the production should adopt in order to follow the speed of incoming sales orders e.g. if the company's production is manufacturing products eight hours/day and the rate of incoming sales orders is 40 per day. The takt time will then be 5 products/hour = 0,0833 products/minute. (ibid, 2003)

#### **2.2.2.1.4 Pull**

The next step in businesses striving to achieve perfection is the concept of pull. This concept builds on the idea that if a customer demands a product, the company should produce and provide it at that specific time, not beforehand and not later, but Just-in-Time (JIT). Instead of pushing the products onto the customers, their demand should control the supply. This idea will decrease the finished goods inventories. (ibid, 2003)

#### **2.2.2.1.5 Perfection**

Perfection is the ideal state where all the muda (waste) is removed and eliminated from the processes. This is of course very hard and difficult, if not nearly impossible, to achieve. Nevertheless, the combination of the four above principles (value, value stream, flow, and pull) create the atmosphere and the opportunity to always challenge and improve the system and the processes in order to strive for a lower amount of waste, and ideally perfection. However, reaching perfection is similar to reaching the horizon. It is difficult, to reach it, and once you made it the perceived picture of perfection has altered, and adopted a new shape. (ibid, 2003)

### **2.2.3 Six Sigma**

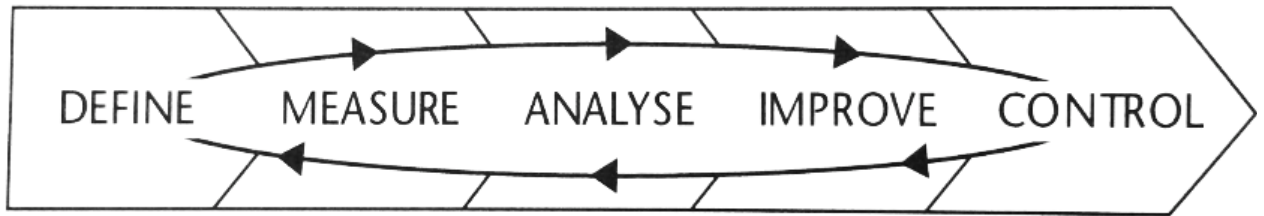
Six Sigma, as a well-thought-out method, emerged from quality management and received a lot of notice for its focus in process developments (Parast, 2011). This methodology was first introduced and designed by Motorola in 1987 as an inventiveness to “*produce high-level results, improve work processes, expand all employees' skills and change the culture*” (ibid, 2011 p. 537). Since then many of the major global companies have created their own Six Sigma initiatives (Magnusson et al., 2003).

The Six Sigma approach helps organisations to perform better by improving their processes, and strengthen the relation between strategic objectives and the realised outcome of these, that is, focuses on how to achieve the business strategy. This approach also provides the organisations with practical tools and methods on how to optimise and measure the company performance. Furthermore, Six Sigma is concerned with reducing as much as possible of the variation, in order to create processes that are stable and reliable. (Magnusson et al., 2003)

Six Sigma has embraced, from martial arts, the idea of indicating one's level of knowledge and ability by using a belt ranking system. There are a few different levels within the ranking system, starting at the top of the hierarchy with a Champion and in the bottom White Belts. (Magnusson et al., 2003)

#### **2.2.3.1 DMAIC**

In Six Sigma, a process improvement methodology called DMAIC is applied. DMAIC is an acronym for Define, Measure, Analyse, Improve and Control, which are the five phases of the improvement project. (Magnusson et al., 2003) The main ideas of the various phases are explained below together with a visualisation of the process.



**FIGURE 2.3** THE DMAIC PROCESS (MAGNUSSON ET AL., 2003)

The *define* phase is concerned with identifying and choosing the right projects and to establish the project team. The team needs to identify the result variable ( $y$ ), which is the variable that should be improved, and estimate the performance of this variable. Furthermore, the process needs to be mapped. (ibid, 2003)

*Measure* is the phase where elements and factors ( $x$ s) that might impact ( $y$ ) are identified. Measurement plans on how to gather data about ( $y$ ) and ( $x$ s) are then created, and lastly executed. (ibid, 2003)

This phase, *analyse*, focuses on two main things; first, to target one of the identified ( $x$ s) and by the help of statistical tools measure if there is any correlation, between the selected ( $x$ s), and ( $y$ ). If not, try one of the other ( $x$ s) and see if the new one impacts instead. Second, during this phase is it important to learn more about the ( $y$ ). This could be achieved by using the newly collected data, acquired during the measure phase, such as predictability, distribution and current performance. (ibid, 2003)

During the *improve* phase the objective is to provide the best solution to the issues based on the knowledge about the ( $x$ s) and the ( $y$ ). If there is more than one possible solution to the issue, a cost-benefit analysis should be undertaken to uncover the optimal solution. Thereafter, the most fitting solution shall be implemented. (ibid, 2003)

The last phase, *control*, focuses on validating that the implemented solution has achieved the desired outcome regarding ( $y$ ). Furthermore, an estimation of how much the project has saved in monetary terms. The knowledge gained from the lessons learned is shared and documented. Lastly, the endeavour is presented to the company and the project stakeholders. (ibid, 2003)

### **2.2.3.2 The Seven-Times-Seven Toolbox**

The seven-times-seven toolbox, also referred to as the Six Sigma toolbox, includes forty-nine different improvement tools divided into seven distinctive groups with seven tools in each group (Magnusson et al., 2003). Below is a picture showing all of the various tools.

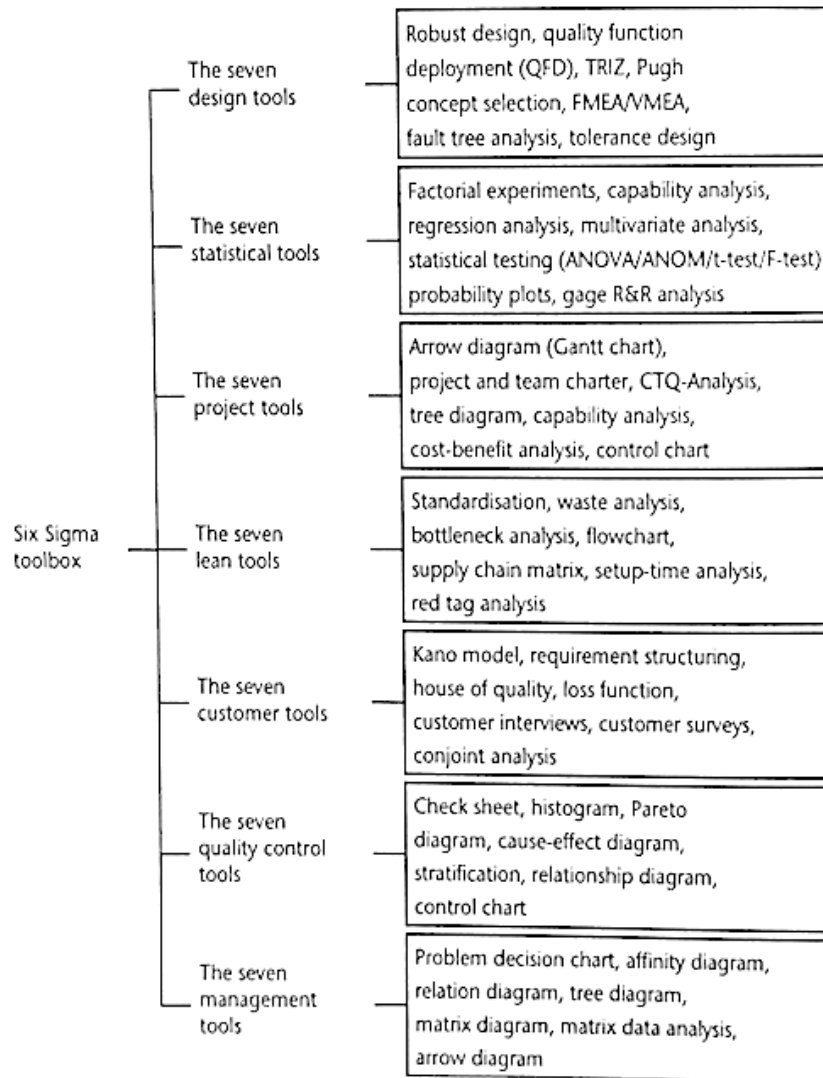
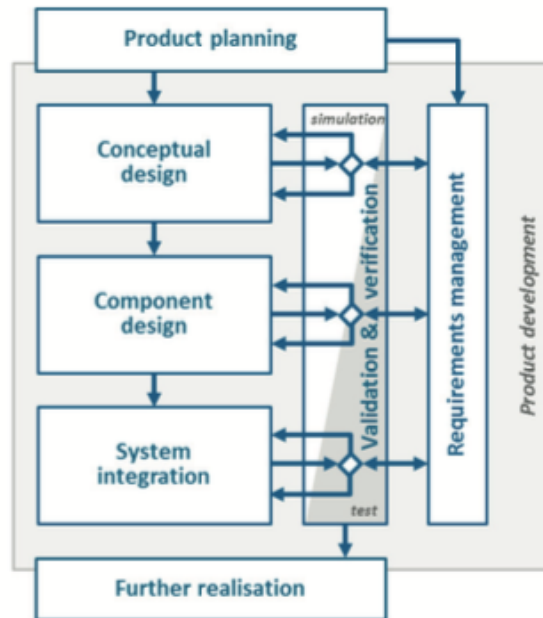


FIGURE 2.4 THE SIX SIGMA TOOLBOX (MAGNUSSON ET AL., 2003)

## 2.3 Product Development

Product Development (PD) is the set of activities necessary to be performed in order to convert a market requirement into a product or service that the consumer demands. Furthermore, PD is companies' means to achieve their strategic objectives. (León and Farris, 2011) In the figure below is an example of how a product development process can be envisioned.



**FIGURE 2.5** THE PRODUCT DEVELOPMENT PROCESS  
(ADAPTED FROM VIELHABER AND STOFFELS, 2014)

Product development projects are often broken into various gates. During these gates there are gate meetings to decide on (e.g. funding, technical content, etc). Prior to these meetings, the project should perform some specific work and provide certain preferred information, which would be the basis for decision-making and further progress. (Naveh, 2005)

According to Gremyr and Fouquet (2012), there are a numbers of characteristics that together create the foundation of a product development processes; (1) *Phases overlap*, (2) *Continual learning and improvement*, (3) *Speed/accuracy in execution*, (4) *Information-intense*, (5) *Adaptability*, (6) *Constant customer- and supplier contact*, and (7) *Problem solving*. Furthermore, Sánchez and Pérez (2002) state that a PD process needs to be timely, unambiguous, simple, accurate, systematic, objective, and precise.

A mechanism that occurs frequently throughout a PD project is iterations. According to Lévardy and Browning (2009) there are several factors causing these iterations. These are:

- *Poor communication*
- *Input changes*
- *Missing activities*
- *Mistakes*
- *Poor activity sequencing*

As mentioned in the chapter 1.1 Theoretical Rationale & Justification, one way to achieve a higher efficiency in PD is by using a Lean Product Development (LPD) approach (León and Farris, 2011). This concept is further explained in the following chapter.

### 2.3.1 Efficiency of Product Development Projects

There are studies showing that product development projects are risky endeavours. According to Sánchez and Pérez (2002) these studies expose that roughly 40% of PD projects struggling receiving profits from the market.

One definition on PD efficiency presented by Sánchez and Pérez (2002 p. 545) reads, “*the optimal use and management of R&D inputs and processes in order to achieve the project’s technology and market goals.*” Womack et al. (1991 in León and Farris, 2011) identified four different features that have a great impact on the growth in efficiency in PD. These features are 1) Communication, 2) Team work, 3) Simultaneous development, and 4) Leadership.

### 2.3.2 Lean Product Development

The Lean Product Development (LPD) concept is based on the ideas of the Toyota Production System (TPS). This approach has displayed a significant increase in quality, decrease in cost and lower lead times in PD compared with corporations and rivals in the Western and Northern hemisphere. According to León and Farris (2011 p. 29):

LPD is viewed as the cross-functional design practices (techniques and tools) that are governed by the philosophical underpinnings of lean thinking – value, value stream, flow, pull, and perfection – and can be used (but are not limited) to maximize value and eliminate waste in PD

Further, Lean Product Development is practiced in PD in order to create a faster flowing PD process (Gremyr and Fouquet, 2012).

However, according to McManus (2005 in Tyagi et al., 2015) there is little research made on the topic of how lean thinking is applied within the product development area. He believes that the reason for this is the big differences between production and product development in terms of how to apply the various lean principles to the different disciplines. “*For example, in the former, loopbacks are associated with wastes and considered to be a diminishing contribution, however in the latter, loopbacks could be associated with gaining important dynamic knowledge*” (Tyagi et al., 2015 p. 203). The way forward at the moment is that the practitioners are testing what possibly could work or not, a learning by doing attitude, because there are no established implementation guide available yet in order to help them apply lean thinking to PD processes. (Tyagi et al., 2015)

<b>Lean principle</b>	<b>Manufacturing/production</b>	<b>Engineering</b>
Value	Visible at each step, defined goal	Harder to see, emergent goals
Value stream	Parts and material	Information and knowledge
Flow	Iterations are waste	Planned iterations must be efficient
Pull	Driven by takt-time	Driven by needs of enterprise
Perfection	Process repeatable without errors	Enables enterprise improvement

**TABLE 2.1** LEAN PRINCIPLES IN PRODUCTION AND ENGINEERING (TYAGI ET AL., 2015)

However, it is important not to forget that LPD does not provide a roadmap for PD but merely contributes support in order to enhance ones processes (Gremyr and Fouquet, 2012). When implementing LPD, it is recommended that one starts with concepts like standardisation, visual management, 5S method, and Seven-types of waste concept (Dombrowski et al., 2014).



## **3. Methodology**

### **3.1 Research Approach**

The researcher used a qualitative research approach to this study because *“the stress is on the understanding of the social world through an examination of the interpretation of that world by its participants”* (Bryman, 2012 p. 380). This study adopted an abductive approach, which is not a combination of a deductive and inductive approach but rather *“a refinement of existing theories than on inventing new ones”* (Dubois and Gadde, 2002 p. 559). If a researcher wants to explore new relationships or new sets of variables an abductive approach is frequently used (Dubois and Gadde, 2002). Below are the inductive and the deductive approach explained in order for the reader to better understand the chosen approach.

An inductive approach is when all the findings and observations that emerge throughout a study are analysed and put together to generate new theory. The epistemological position that is linked with an inductive approach is the one of the interpretivist. Constructionism is the ontological position that is practiced by the same approach. (Bryman, 2012) This means that the *“social phenomena and categories are not only produced through social interaction but that they are in a constant state of revision”* (Bryman, 2012 p. 33).

A deductive approach is when the research is challenging a known theory by testing a hypothesis and then revises the theory if the hypothesis is confirmed. The epistemological position that is practiced by this approach is positivism and the ontological position is objectivism. (Bryman, 2012) *“Objectivism is an ontological position that asserts that social phenomena and their meanings have an existence that is independent of social actors.”* (Bryman, 2012 p. 33).

### **3.2 Research Design**

The research design that was used to conduct this research is a case study. A case study is when a single person, a single family, single community or single organisation, to name a few, is intensively studied and investigated, through observations, analysis of documents and semi-structured interviews with relevant professionals. (Bryman, 2012)

A qualitative research design was chosen, because the case company context provided a good foundation for gathering the necessary data. However, one consequence of choosing a qualitative research design is that it provides a problem in terms of generalising the outcome. This is because the qualitative interviews are often performed in one particular organisation with a limited number of participants. (Bryman, 2012) The data collection methods used in this research are: 1) Interviews, 2) Observations, and 3) Secondary data. The methods are further explained below.

## 3.3 Data Collection Methods

### 3.3.1 Interviews

There are two types of interview approaches commonly used in qualitative research. These are 1) Unstructured interviews, and 2) Semi-structured interviews. (Bryman, 2012) A major advantage of the use of interviews as a data collection method is that this could create greater trust between the interviewee and the researcher, because one could connect on a more personal level. A further advantage is that the interviewees can on a deeper level outline their thoughts on the specific issue and the researcher gets the opportunity to ask follow-up questions on the answers the interviewee presents. (Kvale and Brinkmann, 2014) During a semi-structured interview the researcher often has an interview guide with a couple of questions but respondents have big freedom on how to answer the questions and the interview guide is not followed adamantly. (Bryman, 2012)

The interview type utilized in this research was semi-structured interviews. This type was chosen in order to guide the different interviewees onto the same path, which would make it easier to reveal similar patterns in the respondents' answers. All the interviews were conducted in Swedish in order to simplify the communication with the interviewees.

The interviewees were selected by social networking and by personal contacts i.e. by the use of a snowball technique. The sample size when conducting a qualitative research should not be representative but rather small and purposeful (Khan, 2014).

The interviews were performed in two rounds. The first round was to conduct interviews with four SPLs (System Project Leaders) running the projects but also with one DCL (Design Concept Leader), two GDLs (Group Design Leaders) and one UPL (Unit Project Leader), which all have connection to the project. After analysing the outcome of the interviews, the identified problems were visualised and evaluated.

The second round was to carry out a second round of interviews, in order to investigate and discuss the issues found in the first round even deeper, in order to reach a greater understanding of the underlying problems, pinpointing the root causes behind the issues detected in the first round of interviews. This was performed with one GDL and two UPLs with good knowledge of the processes/problem areas chosen to investigate closer. The interviews were audio recorded, with the given approval from the interviewees, in order to not miss any essential data and thus alter the true results of the study.

The SPLs are referred to as SPL A, SPL B and so forth. The GDLs are referred to as GDL A and GDL B. The UPL and DCL are referred to in this manner. Further, in order to simplify for the reader these labels will be repeated during the empirical findings section. The relationship between these different project managers and project coordinators is further explained in Chapter 4.

The interview forms can be found in Appendix 1-6.

### **3.3.2 Observation**

Observations of the SPL organisation were performed prior to the creation of the interview questionnaire. This was done in order for the researcher to obtain a deeper understanding of the context and setting so that the questionnaire questions would be more mature and advanced. However, the knowledge was directly implemented into the questionnaire and not stored or transferred elsewhere.

### **3.3.3 Secondary Data**

Before the creation of the questionnaire the researcher studied the case company's business management system as well as their corporate processes. This was, similar to the observations, done in order for the researcher to enhance his knowledge of the case company and the SPLs ways of working. However, the knowledge was, directly implemented into the questionnaire and not stored or transferred elsewhere.

## **3.4 Data Analysis**

The data gained from the interviews was structured and analysed in a way that revealed similar patterns in the respondents' answers. Thereafter, the researcher utilized an affinity diagram, one of the seven management tools in Six Sigma, to group the different answers into the various knowledge areas of project management as well as grouping them after the various project management processes they belonged to, this according to the PMBoK. However, the last sub process of PM, closing, was not used because the scope of this research does not initiate any closing activities.

This analysis exposed the most critical activities that the company's PMs need to perform in order to achieve a higher degree of project success due to shorter lead times. These new findings were then presented, and discussed with the SPL organisation in order for the researcher to grasp the impact of the issues on the organisation's daily activities. On the basis of this discussion and the researcher's initial analysis of the data, from the first rounds of interviews, the issues to study further were selected.

## **3.5 Data Validation**

In order to assess a qualitative research there are two main criteria that are needed to be taken into consideration: Authenticity and Trustworthiness. There are four different criteria that together constitute Trustworthiness, these are: Conformability, Transferability, Credibility and Dependability. (Bryman, 2012)

The concept of credibility is that the researcher makes sure that he or she has understood the environment that has been studied correctly by letting the participants comment on the retrieved data. The researcher should also make use of good practice while conducting the research. (Bryman, 2012)

Conformability is the concept related to a researcher not to mix their own values in the survey whilst one knows that he or she cannot be completely objective (Bryman, 2012).

Qualitative studies often tries to explain a certain environment with specific characteristics. Thus, the concept of transferability is how the researcher can describe that milieu and culture, in focus, in enlarger terms so that the findings also can be applied in other settings (Bryman, 2012).

The concept of dependability makes sure that the researcher keeps all the data (e.g. interview transcripts, problem formulation, fieldwork note etc.) This is done so that it can be reviewed by peers to make sure that all the right procedures have been taken into consideration throughout the research. (Bryman, 2012)

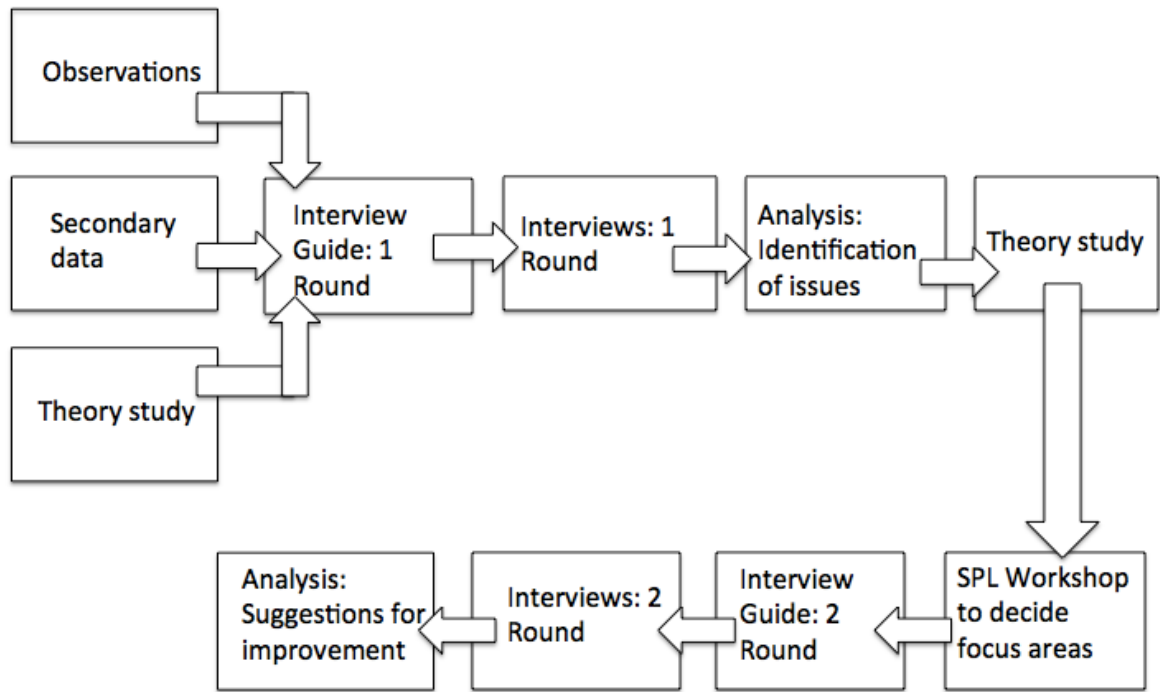
The five criteria that together forms Authenticity are: 1) *Tactical authenticity* – Have the participants become enabled by the study to take action, 2) *Fairness* – Does the study present the different opinions amongst the participants, 3) *Catalytic authenticity* – Has the study been the energy or force which has empowered the participants to modify their settings, 4) *Ontological authenticity* – Have the participants context become clearer for them by the support of the study, and 5) *Educative authenticity* – Has the study helped the participants to better understand viewpoints of others in their milieu. (Bryman, 2012)

By identifying issues imbedded in the organisation this study have helped the participants to take actions on this problems. By looking from different perspectives and various functions the study have displayed different opinions and views. It is the researcher's believe that the study has enabled them to change their working environment to the better by understanding it better and understanding the different beliefs of their co-workers.

Furthermore, the SPL Workshop acted, as a respondent validation activity in order to ensure that the data generated by this research is accurate, truthful and valid.

### **3.6 Research Method**

Figure 3.1 describes the method used to conduct this research project. The observations and secondary data collected at the case company together with the initial theory study created the basis for the interview guide used in the first round of interviews. After the initial interviews an analysis of the data were performed to identify the issues. Then, the theory was revisited again to further develop the researcher's knowledge regarding the identified issues, and how to solve these. Afterwards, were a workshop conducted with the SPL organisation in order to receive their input on which issues to focus on. The input collected from the SPLs and the theory shaped the interview guide for the second round of interviews. The data gathered at the second round of interviews provides the groundwork for the analysis, which presents the suggestions on how to improve the PD process.



**FIGURE 3.1** APPLIED RESEARCH METHOD

## 4. Case Company

*This chapter provides a short description of the case and its context: type of firm, size, type of projects, activities and other relevant aspects.*

The case study is conducted at a Swedish multinational manufacturing corporation. The R&D department, where the research was performed, is divided into a couple of different sections, which in turn consists of various groups. The SPL organisation represents the section responsible for the project management activities. There are approximately 300 people currently working in this department and ten of them in the project management section (i.e. SPL organisation). The utilized organisational structure at the case company is a matrix structure. In the figure below there is a visualisation of the organisational structure. The GDLs are working in the different sections within a department (i.e. the line organisation). The SPLs are project managers for projects concerning a specific department. The UPL is a project manager for the bigger projects concerning a few departments, and the SPL projects are sub-projects, focused on a particular system, to this overriding project. The case company performs high-tech projects with a high level of complexity.

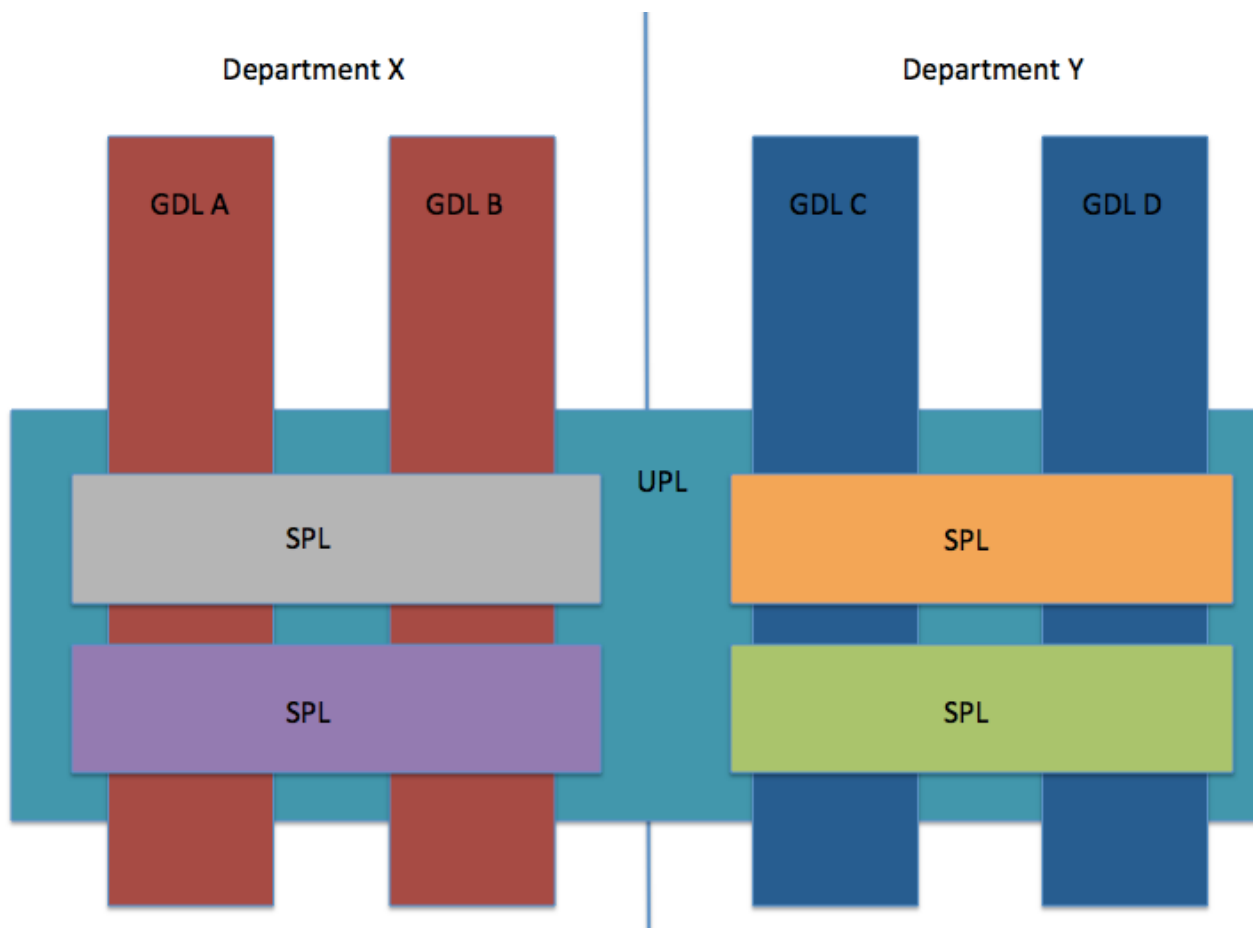
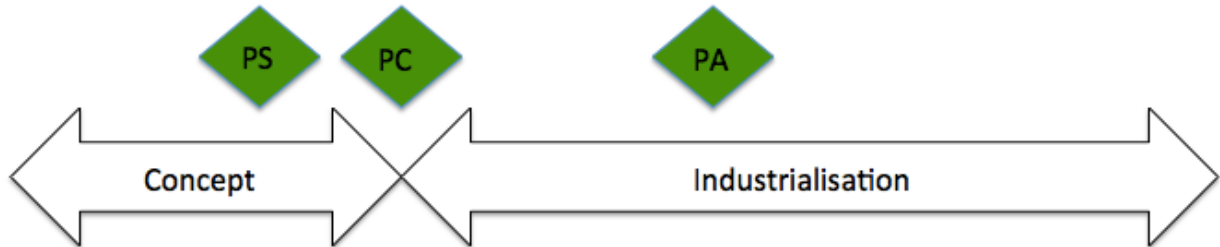


FIGURE 4.1 THE CASE COMPANY'S ORGANISATIONAL STRUCTURE

The below figure visualise the case company's phases and gates, which lay within the scope of this research project. However, notice that this is not all of the phases and gates in the case company's PD process but as already mentioned, only those concerning this study. The DCL executes the project work in the concept phase, whilst the SPLs perform it in the industrialisation phase of the endeavour.



**FIGURE 4.2** CASE COMPANY PHASES AND GATES

## 5. Empirical Findings

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*This chapter presents the data acquired and gathered at the case company. The Empirical Findings chapter presents the following main sections: First-Round of Interviews – Understanding the Challenges, Summary of Initial Analysis, and Second-Round of Interviews – The Focus Problems.*

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### 5.1 First-Round of Interviews - Understanding the Challenges

#### 5.1.1 Initiation

One of the most frequent and bigger issues in the initiation process of the project is that the content of the project is not clarified, and determined, enough from the client, a person located higher up in the hierarchy. SPL C (System Project Leader) declared that when they are assigned to run a certain project, the information about the project is quite often lacking. Many of the technical solutions are not decided yet, and according to SPL B, this could cause prolonged lead-times for the components involved. This is something that also UPL A (Unit Project Leader) and GDL B (Group Design Leader) recognise. However, GDL B mentioned that the content might change but never the amount of resources at hand to carry out the project. On the other hand, UPL A also mentioned that the quality is heavily depending on from where in the organisation the request sits, because this will give the UPL totally different preconditions. Further, UPL A stated that they are putting too much time and effort on the local request process, which is a completely waste of time, because they have already decided to implement it. According to the DCL (Design Concept Leader) a way of decreasing the number of changes throughout a project could be done by having a company strategy that is more solid and stable over time. The reason why this action will help is that the DCL mentioned that a lot of the changes they have today, origins from sources they already know about and have nothing to do with outside sources. “

One needs a better estimation of how much money there is in the company, to perform future projects, and a plan that are stable around this. A big part of changes we have done is based on cuts in the budget even though it has been clear from the beginning what the cost of the technical content would be

Another problem identified in the beginning of a project, in the industrial phase of the project, is that everything that should have been done during the concept phase is not performed. SPL D said, “*We do a lot of validation of the concept. I think that in the industrialisation phase should we be sure that it works, and not test it as much*”. This is an issue recognised by almost all of the SPLs. One SPL believes that this could be because the DCLs (Department Concept Leader) has not got the opportunity to do



everything they wanted, to achieve, because of constraints regarding time and technical solutions.

GDL A, as well as GDL B, point out that the information flow from the SPLs to the GDLs could be improved. Sometimes the information is lacking and sometimes there is an overload of information. Further, the information is rarely refined when the GDLs receives it. One of the GDLs also said that it would have been better if decisions regarding changes were decided before they are communicated to them. However, the same GDL recognised the possible problem of not communicating the information directly, which could create a feeling that the SPLs withhold information and do not play with open cards.

Furthermore, both SPL C and SPL D explained that they feel that there are always information lost in the handover between the concept phase and the industrialisation phase. However, SPL D believes that one solution to this problem could be to walk alongside the liable DCL for some time. Making it possible to share knowledge between the two project managers. SPL C also mentioned that there is no natural process for handovers. UPL A is on the same track:

Right now I have the privilege of working in a project where I am participating in the concept phase too, which hopefully leads to a better understanding of the technology choices that have been made. And one will know on which basis the evaluation is done. If you do not have the background information it is harder to defend or argue for certain technology solutions that you have chosen within a project

The UPL A also stated that it would be a good idea, and that the company would probably benefit from it, if the same person was running the projects, those bigger and more complex, throughout both the concept- and the industrialisation phase.

Moreover, an additional problem is that there are quite often no resources at hand in the beginning of the project. It is almost always the case that receiving the right amount of resources takes time. The bargain for resources between the UPL and SPL, almost constantly needs to take a few loops back and forth before one can reach an agreement. With this in mind, SPL A said, *“I think that we sometimes are not good enough at leaving a sensible response”*.

Another problem recognised in this research is all the different interfaces a designer have to deal with. According to GDL A, all these interfaces create confusion among the designers, who do not know to whom to speak. GDL A declared that one common interface would be preferred.

### **5.1.2 Planning**

The initiation- and the planning sub processes sometime melts together, and creates one process, is noticeable because the participants mentioned a few of the perceived problems in both stages of the project.

SPL B mentioned the potential problems of not owning the resources; it is the line organisation that possesses the ownership of these. Not owning the resources can create prolonged lead-times, when the SPLs need to bargain for them. However, usually the line organisation obeys the requests from the projects, at least initially. SPL C explained:

It usually never a problem to get those hours there and then the problem will occur when 40 projects are competing for the same resource. It is the same men and women who do the job. You never get a dedicated person just working on your project. It is always the same people who are involved in all projects

Many of the SPLs also stated that receiving the right competences to their project could be a bit challenging when there are problems in the bigger and more important projects. Further, the same issues also occur when the department struggles with problems out in the field. GDL A mentioned that for their group there is not an issue receiving the right resources from their own team but the issues emerge when resources are needed from other functions. This GDL continued stating that they need *“to be better at lending resources between the groups. Because it is often that another section is not fully utilised, and that they need to allow staff working cross boarders”*.

Further, the UPL A mentioned that the various project managers never participate in any kind of forum discussing the shape and constellation of the project team, they are just handed a bunch of people and forced to make it work.

SPL B explained that it is much easier to obtain the resource in the end of a project:

Well it's a known issue that we are very good at working effectively at the end of the project. And it is an on going discussion that we need to be better at front loading. That we must work many hours at the beginning of the project and that has, of course, been the ambition from our side in my project

However, SPL B told that the UPL has not provided the resources at this time. The UPL believes that these resources will benefit the project better at the end than at the beginning. *“So even though we here, at our department, want a curve that goes up in the beginning and then valleys down, they want to have a bit more constant curve”* said SPL B in order to explain the differences between them.

Furthermore, an additional problem regarding resources, and then specifically the GDLs, is the succeeding one. For example, SPL A explained:

For smaller ÄT (projects with only some minor content) projects, we usually have no appointed GDL but instead the thought is that we should talk directly to the one responsible for the component. We are also expected to fill in some systems that the GDLs usually manage. There is nothing to say about that, it is possible to manage in a smaller project, but then you still run in to questions that one would need the GDL function (e.g. to fill in of the TSU/POB file)

The best solution would be, according to SPL A, to decide to have GDLs in all of their projects.

Another problem identified in the planning process is the endless work of updating the project, SPL plan. According to SPL C, it is not written in stone that you should have a SPL plan because of the lack of support in keeping it up to date. Though, one solution to this problem, mentioned by SPL C, would have been if all the different levels of project plans were connected or linked together, if all changes made on a superior plan, in their planning tool, would instantly impact all the other underlying plans.

SPL A stated that it will be beneficial if the line organisation had a specific place where they stored all the data and information regarding a specific project, a place accessible for everyone participating in the endeavour. The same SPL also points out an issue regarding the responsibility to update some of the databases. It is the line organisation's duty to fill them in but the accountability sits with the SPLs.

A problem with the case company's planning tool (LEQM) mentioned by GDL A is:

One does not get all the information in to LEQM. We are following-up so much more than what is followed-up in LEQM, all of our tests, supplier stuff etc. LEQM more or less only follows-up the projects steering times. However, in 80% of the cases the follow-up is done in LEQM. It is not good when there are two different plans, and you need to update and follow-up both of them. It generates double planning. The best thing would be to have everything included in one operable program.

### 5.1.3 Execution

A perceived problem in the execution process is that people up the ladder sometimes have unrealistic expectations on how much a specific budget will give in return, in terms of human resources and technical specifications. One SPL pointed out that the superiors do not make a proper health check of what they can expect to get for their money. Thus, the budget negotiation always needs to be looped a couple of times between the SPLs and the UPLs. Further, SPL B mentions that each time they receive a new budget proposal from an UPL, the amount of the budget has decreased. This looping process before agreeing on a budget is something that GDL B also brought up and adds that this could cause problems (e.g. that they will miss the deadline for ordering stuff, from their suppliers, to the next test series).

SPL B also stated another difficulty, which is that when the project should receive a delivery, where more than one group or section is involved, it quite often creates problems because the different teams forget to look at the bigger picture, and instead they work in silos. They also do not have the understanding on how their delivery is impacting another team's delivery. According to SPL B, this could be because they are too focused on their own components or that they are new, in the department or company, to understand how everything is connected. However, SPL B said that when the delivery originates from one group or section there are usually no problems at all.

Two identified problems, related to the meetings structure are: First, meeting participants are not prepared or have not thought everything through, and therefore need to go back and redo certain work. Second, the SPLs could be too vague when delegating responsibilities during meetings, which occasionally leads to uncompleted work on deadline. However, two solutions to these issues, according to SPL A and SPL D, could be to distribute the agenda. If possible, a few days earlier, explaining both the purpose and what is expected of everyone for the particular meeting, and secondly, could be to use a timed agenda with a specific and accountable person, who has to present his or her ideas, area of knowledge etc.

Furthermore, SPL D as well as SPL A recognised that some documents are not used later in the project process. For example, the lessons learnt documents are something that are rarely utilized. A solution to this would be to create a routine of implementing these lessons learnt directly in to the project guidelines, states SPL A. GDL B further

explained that there are a lot of documents connected to the different gates. These documents are used to create a snapshot of the state before a certain gate. To generate these documents could be quite hard prior to certain larger gates. SPL D told the researcher that a further problem may be that a lot of the information occasionally is hidden in PowerPoint presentations. A solution presented, by this SPL, would be to lift some information up on a visual board. *“I like the analogue. I prefer to see it in front of me. I think that others also would liked to have the information about the content of projects, production start times etc.”*

The interviewees also pointed to some problems regarding the suppliers. For example, one problem was that they have not filled in the tenders correctly, which results in that the case company’s system cannot verify the tenders and that they need to be sent back to the supplier, and redone. A second problem that sometimes occurs is that the suppliers are late at delivering their products. However, the SPLs are self-critical and believe that this is often due to late changes, both in schedule and/or technical content, from their side or that the SPLs is late with sending their requests.

SPL C mentioned that the SPLs need to have a more standardised way of working in order to make it easier for all the people involved in the project environment to understand what is requested from them in the different phases of the projects. A similar idea is also presented by GDL B, who pointed out that it is sometimes hard to know the demands aimed at specific gate.

According to SPL D:

The biggest overall problem is that we have different test series. It is often the case that you build one test series, and test it in the car and in the rig. Then you'll want the result, and depending on how it went, give input to make design changes. However, the various test series are positioned very close to each other so before you have received the result from the previous test, you should already have placed the orders for the next test series. Which becomes a very big problem

This problem is something that is mentioned as one of the biggest problems of all the participants in this study. However, GDL A further developed this problem statement:

One problem is that our testing is performed too close to each other. On the other hand, I think that we have the wrong sequencing/timing on our test series, we are building two-three products in X0 (a case company milestone) then we are moving on and build ten in the next stage

This way of thinking is repeated and in the end they are building much bigger volumes of the product. GDL A mentioned that it is not before the building of the bigger volume the problems start to occur more frequently. This make them begin their change process very late, which becomes very costly. GDL A continued:

If we tried to have the change process in a earlier stage instead and tested as much as possible, I think we had saved a lot of money. Even saved a lot of people too, because this creates a very stressful working environment, when receiving everything this late

Another issue presented to the researcher during the interviews was that a perceived feeling amongst some of the interviewees was that some associates did not know their responsibilities or those of others. In certain cases, a line manager could take decisions upon something they think they have mandate to decide on, but in reality,

also a SPL needed to participate in that decision. This insecurity in one's responsibilities and mandates generates strange decision-making paths.

Regarding the distribution of information, GDL A explained that the SPLs are good at sharing but bad at refining and adding value to the information. They also need to learn to filter out the unnecessary information and only provide the required material for that particular GDL.

In the same way as the SPLs stated that the concept phase is not properly completed when the project reach the industrialisation phase, the DCL mentioned that there are quite often AE (Advanced Engineering) projects that are not finished, and some of the systems are not verified enough, when they progress into the concept phase.

#### **5.1.4 Monitoring and Control**

Occasionally, the organisation decides that they, for a limited period of time, should have an extra focus on costs. When this happens, all issues related to costs need to be decided higher up in the hierarchy, which creates prolonged lead-times. SPL D pointed out that this is connected with the fact that they do not receive enough financial means for their projects. Furthermore, SPL D believes that this would have been possible to avoid if the senior management had provided a reasonable budget from the beginning. The UPL A believes that the budget sometimes could be a bit too abstract.

Its not like I have a wallet in that way that I see my money but that is only something that you put into a system. It does not create a feeling that I have accountability for the budget. Money becomes too abstract and I think the SPLs feel the same

Another problem connected to budget and money revealed by GDL B is the case that they are only allowed to take decisions on a very limited amount of money, five thousand SEK (Swedish crowns). This becomes an issue because when the cost is higher then this sum, the GDLs need to get the approval on this from someone higher up in the hierarchy, which often generates prolonged lead times. Notice, that it is still the GDLs who take the decisions, however, somebody just need to get it approved in the system.

SPL D declared that the organisation could improve their process of estimating resource consumption, and then specifically with a focus on man-hours.

As I understand it, some people check what they have estimated in similar projects in the past instead of actually check how much the designers have been reporting, for it would surely be much more interesting. For example, three years ago, I guessed that I needed 500 man-hours so I will use the same figure again. Instead of maybe check on a project with similar content and see how many hours that was reported in that project, say, for example, 800 hours

One of the interviewee mentioned that the SPLs sometimes need to spend a lot of time just finding and searching for information in order to update people up the hierarchy. *“For example, they want all the information in the PSR (a program used by the case company to report status), unfiltered, every fourth week, and not only the information*

*regarding a specific gate*". SPL B stated that the time they have to spend on this particular task, could vary from 3 to 20 hours but it is always a question of hours.

A problem mentioned during the interview with one of the GDL was that some tasks are followed-up in both the project and the line organisation. This of course, creates redundancies due to extra work. Furthermore, this GDL also said that it would be good to have a time schedule that reaches further into the future with a clear description of what is expected to be delivered. The current schedules are often not longer than ten weeks. Additionally, more general information about the bigger project would also be nice to receive according to GDL B.

SPL A mentioned that it is vital that they become better at taking the decisions on their level, and do not lift questions and decisions to the UPL level. This SPL believes that this is linked to control. *"This is because the UPLs wants to be in control. Control is better than trust is the way they work according to sometimes"*. The UPL A also agreed that the SPLs are lifting too many decisions. Further, the UPL stated that the organisations have not really succeeded in the getting the message out that we should dare to take responsibility. A mentioned solution to this would be to clarify and urge the SPLs to take decisions. GDL A also commented on the decision-making process, but thinks that a lot of the problems are linked to insufficient knowledge.

It probably depends on a lack of knowledge from our side. People do not know how much money the SPLs have mandate to take decisions on. Then one lifts it up a level to be sure, because one knows that they have the mandate to take the decision. This creates a lot of excessive running to meetings with managers with wider ties (case company slang for senior managers)

A distraction that the DCL mentioned is that a few managers higher up in the organisation are, very interested in dealing with details. This generates prolonged lead times since the decision-making process will be extended. In order to get rid of this issue, the DCL believes that this is a question of attitude of the leadership that they should not deal with details but rather listen to recommendations of the ones working in the line organisations.

GDL B pointed out during the interview that it would be good if the SPLs could make sure that there was a time every week where the GDLs could have a chance to speak to the SPLs face-to-face. Today most of the communication is done by e-mail, and GDL B argued that it takes time to communicate using e-mails because it becomes easy to misinterpret the meaning of the e-mails. This is time-consuming because then one needs to further explain the question and again wait for a proper answer. *"Instead of bouncing back and forth on e-mail, speaking face-to-face is much more efficient since then I could ask the next question directly instead of spending hours in the mailbox"*.

## 5.2 Summary of Initial Analysis

Most identified problems of the initial interviews, are linked to the following project management knowledge areas:

- Communication
- Human resources
- Scope
- Time

Communication is one of the major impacting factors to numerous of the issues is fairly easy to spot by studying Table 5.1 below. These different problems are occurring throughout the various phases of the project and are connected with poor communication methods.

The second main issue is connected to the human resources provided by the line organisation to the projects. The organisation tries to lower the overall cost of the projects by lowering the amount of human resources needed for each endeavour. However, this mindset causes extensive and unnecessary, bargaining for these resources between the project managers and their superior managers.

The third major problem area is not as easy as the previous two to recognise but it provides the organisation with a lot of extra work. This area was not as divided as the two other in terms of different issues but rather united. However, the problems found in the scope area were mentioned of more or less all the research participants. These issues were related to poorly defined scopes and changes to the scope.

And lastly, the fourth biggest problem area is time. The organisation wastes a lot of time in doing the local request process. This process should be able to standardise in a greater extent according to knowledge the researcher have obtain throughout the study.

Dealing with all the identified issues will be a too massive undertaking, and will not fit in the current timeframe, therefore the researcher has decided to focus on finding the suitable solutions to two of the presented problems. These problems area presented in section 5.3. The decision is based upon a discussion with the SPL organisation, where they were able to provide their input on what issues they felt were most important to find solutions to, and also by selecting those types of problems that were possible for the researcher to implement solutions to. For example, some of the issue may have been avoided by using another type of organisation structure instead of applying the current configuration. However, this is a voyage for the MNC's management team to undertake and too large and complex to manage within the scope of this research.

	Initiation	Planning	Execution	Monitoring and Control
<b>Risk</b>				
<b>Procurement</b>			Suppliers have not filled in tenders correctly	
<b>Communication</b>	Information lost (Conc. --> Ind)	No discussions, constellation of project team	Line organisations working in silos	Too much time spent on updating people higher up in the hierarchy
	Information lacking or overload		SPLs too general when delegating responsibilities during meetings	Hard getting a chance to meet the SPLs face-to-face
			Standardised way of working from SPL organisation --> Clearer instructions for the GDLs	Followed-up both in projects and line organisation
	Designer dealing with too many interfaces	No Data Collection Storage for a particular project - Line organisation	Bad knowledge of ones or others responsibilities	
<b>Human Resource</b>	Bargain for resources --> Time consuming	Back loading instead of front loading		Bad at estimating resource consumption
		No GDLs working in AT-projects		
		Bargain for human resources with line organisation --> Right competences		
<b>Quality</b>	Concept phase not done properly		Problems occur first when building bigger volumes	
			Meeting participants not always prepared	
<b>Cost</b>				Abstract budget
				Lifting decisions because allowance for a small amount – GDL
				Cost focus for a limited time – Not enough financial means
<b>Time</b>	Too much time spent on local request process	Planning tool not powerful enough	Unrealistic expactions from upper management --> budget will return --> looping budget negotiation	
		Update SPL plan --> Time consuming – No Support	Test series too close in time --> Results not implemented	
<b>Scope</b>	Content not clarified enough			
	Change in content, never resources			
<b>Integration</b>			Lessons learned document poorly utilized	Managers dealing with details
<b>Stakeholder</b>				

TABLE 5.1 THE IDENTIFIED ISSUES



## 5.3 Second-Round of Interviews – The Focus Problems

The two issues the researcher has chosen to investigate deeper and to suggest solutions to spring from two of the main issues identified above. The selected issues are the following:

- How can the local request process be more efficient?
- How the SPLs could enhance the interaction and communication with the GDLs by standardise their project homepages and implementing Face-to-Face meetings.

### 5.3.1 The Issues with the Local Request Process

An issue that lately has arisen very frequently, according to UPL C, is that the SPLs only provide an answer that merely covers some of the content in the local requests, and not all of it. It seems like they do not read the local request sometimes but only delivers a response, and that the answers occasionally contain myths.

A problem with the current local request process according to UPL B is the lack of a standardised form that contains the minimum requirements from each of the different units impacted by the local request process. However, the same UPL also raised a warning finger and pointed out that it should not be a list of several A4 pages from each unit, but a “Vital Few” with the four or five most important requirements from each unit in order to estimated. *“This checklist should apply to all the units within our organisation, and provide the possibility to filter on specific units if needed by us”*, adds UPL B. The checklist could be developed by a workgroup consisting of members from all the various units as well as some UPLs. However, this idea of creating a checklist is something that is not supported by UPL C who thinks that this will only give the line managers an additional reason to hide behind in order to avoid taking responsibility. Further, UPL C mentioned that regardless of how many checklists there are it will always be stuff that cannot be filled in early in the projects, because it is part of the project work to find these answers.

An additional problem with this process is that a lot of time is spent on this “ring game”, sending and transferring the information from one particular part of the organisation to the next one and next one before it finally reaches all the impacted units, and sometimes the information has shifted throughout the time it took it to reach the final destination. According to UPL B *“It is very much time spent on moving the information. It would have been easier with a flat organisation where all responded directly. There is too much downtime”*.

Moreover, UPL B felt that sometimes it could be hard to know from where in the organisation one can collect and receive specific knowledge and information. Asked if there are any processes to support them in finding relevant knowledge UPL B replied:

No I don't think so, but one has to ask colleagues about a name of someone that they think can provide an answer, and then you have to walk that path. So one must look for answers by asking around

Furthermore, UPL C stated that it is a quite low level of understanding within the line organisation regarding what kind of information the local request should contain and what the line organisations themselves should produce. *“The whole point is that you*

*are working to develop the project content, and I think there's a low understanding of this in some parts of the line organisation”* said UPL C.

UPL C told that one way to provide the SPLs with some additional and beneficial information about the local request is to include previous projects where these specific products or features have entered before. Then it is easier for the line organisation to estimate how many man hours they have to invest in order to accomplish their part of the project.

### **5.3.2 Interaction between Project Managers and Project Coordinators**

#### **5.3.2.1 Project Homepage**

Information that is needed to be in place on a project homepage are things like project plans, the quantity of the particular product which is going to be produced, but also the production plant's plans on when to buy tools to their assembly line, this according to GDL A.

Furthermore, GDL A believes that SharePoint is a better platform than Lotus Notes to use for a project homepage because of the possibility to create a superior structure there. *“If you get SharePoint up and running and constructs a good structure there, I think it's better”* said GDL A. Moreover, the same GDL mentioned that it is vital that these different homepages have the same structure and appearances for the convenience of the users. This includes the smaller projects as well. GDL A stated:

It bothers me a little that the smaller projects think they will get away just because they are small. But we still need the same basic information from those projects. Instead, we need to send a question to the SPLs and then they have to find a solution in another way

Additionally, it would be to prefer if all projects were stored in the same location, and positioned in a logical and strategic order. In terms of accesses to the different platforms there are no problems acquiring those if needed to either of the systems.

#### **5.3.2.2 Weekly Face-to-Face Meeting**

The purpose with this meeting should be to provide an opportunity for the GDLs to lift and discuss particular issues regarding their parts and sub systems but also for all other remaining questions they might have. For example, GLD declared:

It might be some cost changes that you do not know how to manage. These problems are better to deal with during this meeting, according to me, but it should not be allocated more than maximum one hour of the SPLs' working hours per week, and then you have to slot up that hour

These meetings should be located roughly an hour after the weekly SPL meeting to be as efficient as possible. This is because most of the issues arise in connection with the SPL meeting, however, a time gap between the SPL meeting and the Face-to-Face meeting will give the SPLs an opportunity to divide their time between the GDLs according to GDL A.

Furthermore, GDL A declared that these kinds of meetings will be very beneficial for new members of the organisation, they will provide an extra occasion to receive support and backup.

## 6. Discussion

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*This chapter provides a discussion of the outcome of the analysis between the Empirical Findings and the theory presented in the Theoretical Framework chapter.*

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### 6.1 Arising Findings

The results of the study show that there are many problems associated with the product development process efficiency in regards to the project management practices. The biggest issues are linked to project management knowledge areas such as communication, scope, time and human resources. The results also displays, with the support of the theoretical framework chapter that there are efficient ways to prevent the onset of these problems.

Further, what factors are seen as key areas of knowledge within PM? These factors vary depending on which theoretical framework one chooses to trust or follow. However, for this study the researcher has chosen to rely on the framework of PMBoK, and the factors presented by Abdul Rasid et al. (2014); Sanjuan and Froese (2013) in chapter 2.1.

The reason this framework was preferred instead of the others was because the researcher claimed having a greater knowledge of the chosen one, but also because the MNC itself operates according to the frameworks provided by PMI. Further, the knowledge areas found in PMBoK are also the same as the ones found in ISO 21500.

Thus, what kinds of issues could one find in a product development process that are connected to the above factors? The initial analysis conducted on the foundation of the data gathered during the first eight interviews provided the researcher a holistic understanding of where the problems were hidden within the R&D department. In Table 5.1, found in chapter 5, all these identified issues are showed and grouped together, according to the different phases of a project where they appear, as well as to which factors the issues are related to.

The issues impacting the SPL organisation most comprehensively, in terms of efficiency, are the difficulties with the local request process, the bargain for resources, changes to the scope and that their test series is positioned too close in time to each other. These various issues are connected to PM knowledge areas of communication, scope, time, and human resources.

The current organisational structure also causes problems for the MNC. Some of the decisions for the projects are taken by the project manager and stakeholders themselves and some of the technical decisions are decided by the line organisations. This creates difficulties because the people working on the projects do not know if it is their line manager or the project manager who is accountable for a particular decision. With a clearer organisational structure a lot of the existing issues would most likely disappear e.g. who is the responsible for a specific decision, the feeling that the budget is too abstract, some of the information losses during the handover between

the concept and industrialisation phases, and that the designers have to deal with too many interfaces.

Furthermore, several of the issues that the MNC faces today are caused by unplanned iterations. The only time the MNC plans their iterations are in major projects, and even then, they are not always prearranged. According to Tyagi et al. (2015) iterations must be planned and optimised in order to be as efficient as possible. Both the issues with bargaining for resources and the local request process are examples, from this research, pointing to the waste of iterations when they are not planned or enhanced. These unplanned iterations cause the MNC prolong lead times and rework, which in the end will generate increased project costs, and thus a lower efficiency.

## **6.2 Recommendations for Improving the Efficiency**

Hence, an approach to solve several of the identified issues is to implement a lean thinking attitude. As presented by Womack and Jones (2003), organisations should start to focus on the value adding activities, value defined and seen from the customer's point of view, for example by minimising or completely eliminating all the waste in their organisation. This could be achieved by letting the customer pull the value e.g. the GDLs could whenever they want pull information from the SPLs or project homepages. The MNC should also focus on achieving a faster flow of value stream and this could be reached by improving the local request process, which is an activity that at the moment creates prolonged lead-times, and thus a lot of headaches. All the identified problems could also be investigated in depth by using a Six Sigma approach and the DMAIC process as presented by Magnusson et al. (2003). This study could be seen as the define phase, and that the (y) variable correspond to all the identified issues, as well as the measure phase where the different issues have been linked to the different knowledge areas of project management. The next step will be to analyse all of these problems by using statistical tools according to the Six Sigma methodology.

However, something in the organisations way of working that contradicts lean thinking is the problem with distribution of the information. Sometimes the SPLs provide an excessively amount information and sometimes the information is lacking. On one hand, if the SPLs distribute too much information they have spent considerable time creating the material. On the other hand, if the SPLs provided too little information, or material of a bad quality, the GDLs needs to spend time trying to obtain the lacking information, either way this generates overproduction, which is opposite the whole idea of lean thinking that expect to be thorough in order to produce real customer value. A possible solution to this problem would be to make use of a pull system and let the GDLs ask for the information or to create a common storage there everyone can acquire the information when needed, and then obtain the information or knowledge just-in-time.

Another problem, connected to communication, is that the people on different levels within the organisation, spend a lot of time updating people higher up in the hierarchy, this is referred to as NVA activities. These activities are not creating any value for the customers and therefore should they be eliminated or at least minimised. However, this is an upper management question whom must begin applying “trust is better than control” approach with the purpose overcome this issue.

Furthermore, a way to make the local request process more efficient could be by standardise it by the use of, for example, a checklist containing the most vital information the SPLs must have in order to perform an estimation on their side. A further thought might be to investigate if there are any information losses when the material is distributed down the hierarchy in the organisation. That this might be the case is the researcher's feeling and perception, however, this study does not provide or submit any evidence that this is the situation.

Moreover, two different alternatives with the purpose for the SPLs to enhance the interaction with the GDLs could be by aligning and standardising all their project homepages, and by implementing weekly Face-to-Face meetings. The standardisation of the homepages will enable the GDLs to more easily find the right information at the right time. Further, a homepage will also enable the GDLs to pull and extract relevant information from the homepage just at the exact time it is required. However, the Face-to-Face meetings are something that will most likely increase and enhance the communication in the organisation, and according to Zulch (2014) planning meetings is a way to manage the communication properly. Another important argument for implementing Face-to-Face meeting is that, as mentioned by Cervone (2014), different stakeholders have different demands and desires regarding their project manager's communication methods. Some of them might prefer electronic communication (e.g. email), whilst others prefer reports from meetings (i.e. written communication). However, some might prefer but perhaps even more importantly: need their project managers to use oral communication methods. A Face-to-Face meeting will be a way to acknowledge and address that need for oral communication on a weekly basis.

How could the results be interpreted then? What one could say with certainty about the results is that the issues are all of them linkable to knowledge areas of a PM and that there are a lot of issues emerging during an endeavour like generating a new product. However, there also methodologies, to be found in the theory, in place to solve these issues. These methodologies provide a certain mindset on how to improve the efficiency of the PD projects. Thus, the results also express a need for project managers to continue developing their knowledge in the areas of PM.

### **6.3 The Implications of the Research**

The consequences of the results are vital because they show that iterations are something that appears quite frequently in an MNC's PD projects. However, as seen in the Project Management Process (PMBok, 2005), there are loops between the planning and execution processes, this indicates that it is probably almost impossible to run PD projects without any iterations. Nevertheless, as long as this is known, and acknowledged, one knows how to manage the iterations by planning them and to construct them as efficient as thinkable (i.e. eliminate as much waste as possible from the process).

Furthermore, the outcome of this study could also act as a guideline for project managers in order to prioritise, which PM factors they should primarily focus on for reaching the best potential result in their projects. Moreover, this research's analysis also exhibited in which process group the various problems occur, therefore could this knowledge be used by a project manager to know how to customise his or her leadership to focus on certain aspects of PM during the different phases of a project in order to achieve a positive and successful outcome.

One source of uncertainty in the study is the fact that some of the identified issues presented in Table 5.1 could possibly be linked to other knowledge areas if analysed by another researcher. This is because during the analysis, performed by using an affinity diagram, the researcher's own preconceptions of the knowledge areas most likely affected the grouping of the different emerging issues. This could most certainly been avoided if there had been several people, which together had conducted the grouping by discussing and arguing for their various individual positions.

What have the implications of the method been on the results? A limiting factor of the study has been that so few interviews were carried out with the GDLs and UPLs in the initial round of the study. More interviews conducted with these different roles, had most likely lead to several more identified issues in the processes active in the interfaces between these functions and the SPL organisation.

The benefits of using the chosen method have been that the case company provided extensive material and data. However, the disadvantage of applying this method is that the outcome becomes very context specific, and would be harder to transfer to other settings and contexts.

Thus, what are the weaknesses and limitations of the research? As mentioned above one limitation is the problem of transferring the results to other contexts. Further, instead of applying a qualitative approach to the initial data gathering a quantitative approach had most likely displayed more issues, as it would have been easier to receive input from more employees working in the selected context. However, the qualitative approach has probably given the researcher a deeper insight in the complexity surrounding the identified issues.

## 7. Conclusions

This research has explored how to increase the efficiency of a product development process through enhancing the project management practices. For this purpose, the investigation has identified the factors, and their attached issues, that constitute the knowledge areas within project management. Further, the research has also generated quite potential solutions to some of the identified issues.

Additionally, the following research questions have been answered in order to reach the above objective.

- What factors are key areas of knowledge within project management according to PM standards?
- What are the issues connected to these factors today?
- What solutions could be implemented to solve these emerging issues?

The discoveries in the literature indicate that the factors seen as key areas of knowledge within project management could differ depending on which standards or frameworks one chooses to follow. Particularly, this research adopts the knowledge areas found in the PMBoK, which are: *Risk, Procurement, Communication, Human Resource, Quality, Cost, Time, Scope, Integration, and Stakeholder*. The reason for addressing the PMBoK was due to the MNC applied this method.

The empirical findings at the case company revealed that there is a wide range of issues connected to the above PM knowledge areas. For example, the R&D department has poor communication methods, the projects spend too much time on the process of bargaining for resources from the line organisation, the top management strategies are not as well-defined as they need to be, which creates poorly defined project scopes and changes to the project scope. Furthermore, the MNC also spends a lot of time on their local request process. However, this was only a few of the countless issues displayed at the MNC, all of the issues are presented in Table 5.1. Thus, in order to increase the efficiency in the PD process through enhanced PM, one has to focus on the main problem areas. The latter were related to the knowledge domains of Communication, Human Resources, Scope, and Time. These issues were disclosed by conducting interviews with project managers and project coordinators currently employed in the Swedish MNC.

A way to solve, improve, and rationalise some of these emerging issues could be by implementing a lean thinking mindset. The research has also given suggestions on how to enhance the interaction between the SPLs and the GDLs by implementing Face-to-Face meetings as well as standardise the project homepages. Further, one-way to improve the local request process could be by implementing a checklist, which applies for all the concerned units.

### 7.1 Recommendations for Future Research

This research has indicated that the MNC's current organisational structure itself has contributed to some of the identified issues. One recommendation for future research would be to investigate, which kind of organisational structure that gives the best support to the project management activities in a PD process.

Further, more recommendations for future research could be to explore, in depth, some of the other issues identified in this research. For example, how MNCs manage change requests but also if there is any room for improvements in this change process.

An additional recommendation for a potential research would be to investigate the complexity of interface management in connection to project management practices.



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## *Interview Guide - Design Concept Leader (DCL)*

*This research is about how a Swedish MNC could enhance and increase the efficiency in their project management process. The scope of the questions is between the gates PS (Program Start) and PA (Program Approval).*

### **1. General**

- a. Within which department do you work?
- b. What kind of function do you have there?

### **2. Initiation**

- a. What kind of issues could you see arise when you handover the project?
- b. Do it happen that you miss the handover date? In that case, why? If so, how do you solve it?
- c. Do you perform lesson learnt after you handed over the project?

### **3. Planning**

- a. Do you receive enough resources to meet the handover dates in the projects?

### **4. Execution**

- a. What are your biggest issues, with regards to lead-time, cost and quality, as you see it between the gates PS and PA?

#### **b. Deliveries**

As I understand it, all the concept work is not always done when it is handed over to the industrialisation phase. What is the reason? Solution?

Would it be possible to have all the verification work done before handing over to industrialisation phase?

#### **c. Meetings**

How much time do you spend on meetings (preparations, meeting time, post-production) during a week? Would it be possible to make it more efficient?

For how long do you have to wait in order to arrange a meeting with an expert within a particular area of expertise?

How often do you have to redo meetings because someone has not brought the information that he or she needs to answer?

**d. Communication and documentation**

Some SPLs feel that there are information losses in the handover between the concept phase and the industrialisation phase. Do you feel the same? Any solution?

When you run a project together with a SPL how do the division of responsibilities work? Is the division clear for all stakeholders involved?

**5. *Monitoring and Control***

a. Are there any issues connected to monitoring and control in a project according to you?

**b. Decisions**

Are there any decisions that currently need to be taken by a steering group that you think that you could handle yourself instead?

**c. Change Management**

How often do changes create problems in the projects?

How often do resources changes cause problem?

**6. *Improvements***

a. In your opinion, what are you less good at when running a project? What do you need to improve?

b. Which activities in your project management process do you think cause problems that results in prolonged lead times, increased costs or decreased product quality?

### *Interview Guide - Group Design Leader (GDL)*

*This research is about how a Swedish MNC could enhance and increase the efficiency in their project management process. The scope of the questions is between the gates PS (Program Start) and PA (Program Approval).*

#### **1. General**

- a. Within which department do you work?
- b. What kind of function do you have there?

#### **2. Initiation**

- a. What kind of problems do you see in the beginning of a project?
- b. Do you work in the Concept phase?
- c. Could it arise problems during the handover form the Concept phase to the Industrialisation phase?

#### **3. Planning**

- a. Should you act as resources to the project or what is your view?
- b. The planning in LEQM, whom should perform it according to you?
- c. Are there any other situations when it is hard and time consuming to receive resources?

#### **4. Execution**

- a. What do you spend most time on in a project?
- b. What are your biggest issues, with regards to lead-time, cost and quality, as you see it between the gates PS and PA?
- c. Should GDLs also work in the ÄT-projects?

#### **d. Deliveries**

Is it common that the line organisation is late with performing their responsibilities?

Databases that are the line organisation's responsibility to fill in but the projects responsibility to follow-up, would it be better if the line organisation had all the accountability for these?

**e. Meetings**

How much time do you spend on meetings (preparations, meeting time, post-production) during a week? Would it be possible to make it more efficient?

How often do you have to redo meetings because someone has not brought the information that he or she needs to answer?

**f. Communication and documentation**

Do you feel that you receive the right amount of information from the SPLs? Is there any information you are lacking?

What kind of communication methods do the SPLs use? Are these efficient?

How does the communication between different groups / sections that work together on a common task work?

Are there any documents being created that are only used to report status and are not used later in the process? If so, is it necessary?

**5. *Monitoring and Control***

a. Are there any issues connected to monitoring and control in a project according to you?

**b. Decisions**

Are there any decisions that need to be taken at higher level that you think that you could handle yourself instead?

**c. Change Management**

How often creates changes problems in the projects?

How often creates resource changes problems?

**6. *Improvements***

a. What do you think you are less good at when running projects? What could you improve?

- b. Which activities in the SPLs project management process do you think cause problems that results in prolonged lead times, increased costs or decreased product quality?
- c. Would it be preferred if all the SPLs worked in a similar manner?



## *Interview Guide – Unit Project Leader (UPL)*

*This research is about how a Swedish MNC could enhance and increase the efficiency in their project management process. The scope of the questions is between the gates PS (Program Start) and PA (Program Approval).*

### **1. General**

- a. Within which department do you work?
- b. What kind of function do you have there?

### **2. Initiation**

- a. What kind of issues might arise when you delegate a project to a SPL?
- b. Could problems arise during handover between the Concept phase and the industrialisation phase?
- c. The information in the local requests could shift a lot. Is this possible to standardise?

### **3. Planning**

- a. How do you think the process of allocating resources to a project work? Are there any room for improvements?
- b. Do the SPLs usually get the resources they initially ask for?
- c. Are there any other situations when its hard and time consuming to extract resources?

### **4. Execution**

- a. What do you spend most time on in a project, with regards to the SPLs?
- b. What are your biggest problems, with regards to lead time, cost, and quality, as you see it between the gates PS and PA?

#### **c. Deliveries**

Is it common that the SPLs are late, performing their responsibilities?

Could it be the case that people higher up in the hierarchy sometimes have unrealistic expectations what a certain amount resources will give you?

**d. Meetings**

How much time do you spend on meetings (preparations, meeting time, post-production) with a SPL during a week? Would it be possible to make it more efficient?

How often do you have to redo meetings because a SPL has not brought the information that he or she needs to answer?

**e. Communication and documentation**

Do it arise any issues regarding the information flow through a project? Between SPLs and UPLs?

Could the content in the local requests be clearer?

Are there any documents being created that are only used to report status and are not used later in the process? If so, is it necessary?

**5. *Monitoring and Control***

a. Are there any issues connected to monitoring and control in a project according to you?

**b. Decisions**

Are there any decisions that need to be taken at higher level that you think that the SPLs could handle themselves instead?

Certain questions that should be decided on department level are quite often lifted higher up in the organisation. Your view on that?

**c. Change Management**

Your views on changes? These could sometimes cause problems not only for the project but also for suppliers.

How often do resources changes cause problems?

**6. *Improvements***

a. What do you think the SPLs are less good at when running projects? What could they improve?

b. Which activities in the SPLs project management process do you think cause problems that results in prolonged lead times, increased costs or decreased product quality?

## *Interview Guide - System Program Leader (SPL)*

*This research is about how a Swedish MNC could enhance and increase the efficiency in their project management process. The scope of the questions is between the gates PS (Program Start) and PA (Program Approval).*

### **1. General**

- a. Within which department do you work?
- b. What kind of function do you have there?

### **2. Initiation**

- a. What kind of issues could arise when you are delegated a project?
- b. Could problems arise during handover between the Concept phase and the Industrialisation phase?
- c. Is it common that you have to change the scope of the project after you have received it?

### **3. Planning**

- a. How do you create the project plan?
- b. Do you need to update the project plan often?
- c. Are you handed the resources you need directly in the beginning of the project?
- d. Are there any other situations when its hard and time consuming to extract resources?

### **4. Execution**

- a. What do you spend most time on in a project?
- b. What are your biggest problems, with regards to lead time, cost, and quality, as you see it between the gates PS and PA?

#### **c. Deliveries**

Is it common that the line organisations are late, performing their responsibilities?

Could it be the case that suppliers sometimes are late, performing their responsibilities?

**d. Meetings**

How much time do you spend on meetings (preparations, meeting time, post-production) during a week? Would it be possible to make it more efficient?

For how long do you have to wait in order to arrange a meeting with an expert within a particular area of expertise?

How often do you have to redo meetings because someone has not brought the information that he or she needs to answer?

**e. Communication and documentation**

Do it arise any issues regarding the information flow through a project? Between the project and the line organisation?

Are there document created that are not used later in the process?

**5. *Monitoring and Control***

a. Are there any issues connected to monitoring and control in a project according to you?

**b. Decisions**

Are there any decisions that need to be taken by a steering group that you think that you could handle yourself instead?

**c. Change Management**

How often creates changes problems in the projects?

How often creates resource changes problems?

**6. *Improvements***

a. What do you think you are less good at when running projects? What could you improve?

b. Which activities in the SPLs project management process do you think cause problems that results in prolonged lead times, increased costs or decreased product quality?

## *Interview Guide - GDL Round Two*

*This research is about how a Swedish MNC could enhance and increase the efficiency in their project management process and this interview is performed in order to understand how one could improve the interaction between the SPLs and GDLs.*

### **1. General**

- a. Within which department do you work?
- b. What kind of function do you have there?

### **2. Project Homepage**

- a. What kind of information would be nice to have here?
- b. What kind of functions shall be here?
- c. How should the homepage be designed?
- d. Where should it be placed?
- e. Who should have access to it?
- f. Should the homepage have a similar appearance for all projects? Or should it be exceptions? Differences between small and large projects?
- g. Would it be able to store all project specific data on the project homepage? (For example, project plan, product information etc.)
- h. Any additional thought regarding the project homepage?

### **3. Face-to-Face meetings**

- a. What should be the purpose of these meetings? What should be the outcome from them?
- b. How should you prepare to receive the above outcome?
- c. How often should these meetings be held?
- d. When during the week should they be placed?
- e. Always the same time each week? A fixed time?
- f. Predefined duration or based on needs?
- g. Predefined agenda or based on needs?
- h. Any additional thoughts regarding these meetings?

## *Interview Guide - UPL Round Two*

*This research is about how a Swedish MNC could enhance and increase the efficiency in their project management process and this interview is performed in order to understand how one could improve the local request process.*

### **1. General**

- a. Within which department do you work?
- b. What kind of function do you have there?

### **2. Local request**

- a. What part of the local request process are most time consuming according to you?
  1. Why?
  2. Could one make this more efficient?
- b. Do you work according to any checklist?
- c. Do you feel that it is hard to acquire enough information to the local request? If so, from whom?
- d. If there is information lacking for the SPLs, how should they obtain it?
  1. Through you?
- e. Would it be possible to standardise the information in the local requests?
  1. If yes, how?
  2. What information would you need from the SPLs?
- f. What part of the organisation is it usually hardest to acquire information from?
  1. Do you receive enough from them?
  2. Is it accurate and of good quality?
- g. How do you proceed today to make sure that the local requests contain enough information?
- h. Do you have any additional suggestions on how to improve and develop the local request process?