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Prerequisites for an ICT-platform at Volvo Group Trucks

Study of the product development and production interface within projects

Master's thesis in Production engineering

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Gothenburg, Sweden 2015

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ABSTRACT

This work was conducted at Volvo Group Trucks Operations (GTO) at Lindholmen, Gothenburg.

Product development projects at Volvo Group Trucks have a tendency of being delayed. One possible problem causing this effect is the lack of transparency between two departments handling product development and production. This thesis investigates if an ICT-platform could facilitate the communication and information flows, the use of IT-tools and project processes in project work, which otherwise could hinder the collaboration between the two departments.

The research was first conducted by a pre-study which focused on getting background information of the different project processes and tools used by the departments. The acquired knowledge was used to construct interview questions which were asked to employees at Volvo working with the mentioned areas. The empirical findings from the interviews were used in the analysis together with theory found in the literature study.

From the analysis several improvement areas were found and categorized as: communication, documentation, knowledge, resources and gates. Several improvement areas showed that they could be supported by an ICT-solution, but some areas was found to hinder the implementation of an ICT-platform. Due to the limitation of the project the authors of this thesis could not say in what extent the improvement areas were affecting other departments at the company.

Keywords: ICT, project, standardization, process

SAMMANFATTNING

Det här arbetet genomfördes på Volvo Group Trucks Operations (GTO) på Lindholmen i Göteborg.

Produktutvecklingsprojekt inom Volvo Group Trucks har en tendens att försenas. Ett möjligt problem som orsakar den här effekten är bristen på transparens mellan två avdelningar som hanterar produktutveckling och produktion. Det här examensarbetet undersöker om en ICT-plattform kan underlätta kommunikationen, informationsflödet, användningen av IT-verktyg och projektprocesser i projektarbeten, som annars skulle kunna hindra samarbetet mellan de två avdelningarna.

Undersökningen genomfördes först genom en förstudie som fokuserade på att få bakgrundsinformation om de olika projektprocesserna och verktygen som används av avdelningarna. Den förvärvade kunskapen användes för att konstruera intervjufrågor som ställdes till de anställda på Volvo, som arbetar med de nämnda områdena. De empiriska resultaten från intervjuerna användes i analysen tillsammans med teorin från litteraturstudien.

Genom analysen kunde flera förbättringsområden konstateras och kategoriseras som: kommunikation, dokumentation, kunskap, resurser och ”gates”. Flera förbättringsområden visades att de skulle kunna stödjas av en ICT-lösning, medan det konstaterades att vissa områden skulle hindra tillämpningen av en ICT-plattform. På grund av arbetets avgränsning kan författarna till denna studie inte säga i vilken utsträckning förbättringsområdena påverkar andra avdelningar på företaget.

Nyckelord: ICT, projekt, standardisering, process

PREFACE

This work was partially supported by the Know4Car project, grant agreement number 284602, funded by the EC Seventh Framework Programme theme FoF-ICT-2011.7.4.

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There are several people we like to acknowledge that helped us during our thesis work. First of all, we would like to thank our supervisors at Volvo Group Trucks, Pierre Johansson and Atieh Hanna, for their supporting roles and all their input and feedback throughout our thesis work.

We would also like to thank our examiner Åsa Fasth-Berglund and supervisor Magnus Åkerman at Chalmers University of Technology, who have helped us greatly with structuring our thesis and given advice on how to proceed with the project.

We are deeply grateful for all eleven anonymous interviewees for have taken the time and answering our questions. Without them we would never had acquired the knowledge to complete this thesis.

Last but not least, we would like to thank Volvo Group Truck Operation for the opportunity to conduct our master thesis within their organization, as well as the whole group at the office who made us feel welcomed.

Gothenburg, June 2015

Regards,

David and Johan

ABBREVIATIONS

Ad-hoc	– “Created or done for a particular purpose” (Oxford dictionary)
CPM	– Chief Project Manager
DFA	– Design For Assembly
DVP	– Develop Product and Aftermarket Product Portfolio
GTO	– Group Trucks Operations
GTT	– Group Trucks Technology
ICT	– Information Communication Technology
ICT-platform	– Several ICT-solutions that cooperates
ICT-solution	– A function that facilitates one project area
ILG	– Industrial Launch Group
JSON	– JavaScript Object Notation
K4C	– Know4Car
OBS	– Organizational Breakdown Structure
PAP	– Project Assurance Plan
PGT	– Project Governance Tool
PM	– Project Manager
PMR	– Product Modification Request
PSM	– Project Steering Model
PTM	– Project Time Management
QDCF	– Quality, Delivery, Cost and Feature
RBS	– Resource Breakdown Structure
SC	– Steering Committee
STP	– Standard Time Plan
WBS	– Work Breakdown Structure
White-book	– Summary of a completed project, including lessons learned
XML	– Extensible Markup Language

TABLE OF CONTENTS

1. INTRODUCTION

The introduction chapter includes a background of the company which includes the current state at the company and a general description of the theory surrounding the problem definition. A short background information about the origin of this thesis will be brought up in chapter 1.2. The problem definition brings up the current problem and then the purpose chapter describes why the chosen methods have been used. After chapter 1.4, the research questions narrow down the research field to end up with the aim of this paper. The last chapter limitation includes both limitations and delimitations.

1.1 Background

The project was conducted at Volvo Group Trucks Operations (GTO) at Lindholmen, Gothenburg. GTO is a department under Volvo Group Global. The Volvo Group employs around 100,000 people and is a world leader in trucks, busses, industrial and marine engines and construction equipment. GTO handles the production of engines, transmissions, spare parts and vehicles for Volvo Group Trucks. This also includes managing the process changes in the production.

GTO follows a certain flow when working on a project which is called Project Steering Model (PSM). PSM helps steer the project towards important activities that are executed in the right order, open gates and complete the project. There are several factors that can activate a production project; optimization of a process, improvement of work ergonomics and product changes.

Product development and changes are handled by Group Trucks Technology (GTT). GTT preforms research in product development, product planning and support products in the aftermarket. At the moment, GTT has a project model called “Develop Product and Aftermarket Product Portfolio” (DVP). The process of handling a project in a product development environment is documented in the DVP-Handbook. The handbook describes the principles and different activities on how to handle product development projects. The cross-functionality between GTT and GTO is a well discussed subject at Volvo Group Trucks both concerning projects and assignments. The focus on this thesis is on how the project work at GTO and GTT is preformed and also the correlation between the two departments in product development projects.

How well a communication and information flow between the two departments determines the quality of the product and how fast the product can go into production (Bellgran & Säfsten, 2010).

One way of supporting the information and communication flow is by using an ICT-platform (Information Communication Technology), ICT-solutions can help speed up the product project, increase the efficiency between engineering and design, and increase the collaboration in an organization (Camarinha-Matos, Afsarmanesh, Ollus 2008).

This thesis will investigate how and if an ICT-platform can support the structured project work and information flow between GTT and GTO. The aim of this thesis is to see if an ICT-platform can support process/activities and visualized information channels to increase the efficiency and transparency of project work. This master thesis originates from the project

Know4Car (K4C) which is an EU initiative to increase the collaboration between companies. The chapter below gives further information about the K4C project.

1.2 Know4Car

Know4Car is a project which involves several companies and institutions, supported by EU, who are developing an Internet based tool (ICT-platform) for managing manufacturing knowledge. Focus lies on collaboration between product, production and suppliers. The aim of K4C is to be user friendly where the right knowledge easily can flow between internal and external stakeholders. See Figure 1.1.

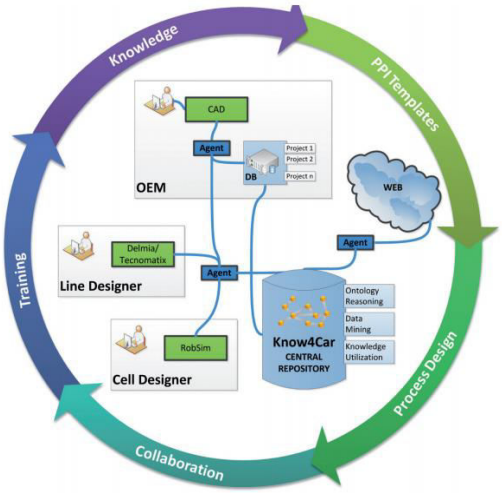


Figure 1.1 Know4Car Circle. (Know4Car consortium, 2015)

1.3 Problem Definition

The transparency and collaboration between GTT and GTO is known to be a problem when working in product development projects. These problems sometimes result in product projects being delayed. This is not supported by the principles that should be followed in a product project.

One transparency problem is that GTO generally finds that they are getting hands-on information too late when working in product development projects and that it is hard to get hold of this information by their own. At the current state, it is the project manager at GTO that has deeper knowledge on the activities that are being carried out in a product development project. Employees at GTO need to go through their manager to retrieve this information. This thesis strives to find a solution to make the interface between GTT and GTO more transparent and increase the collaboration.

1.4 Purpose

The purpose of this thesis is to investigate and document the practical project work, including communication and data flows. The documentation will then be used to identify improvement areas. These improvement areas will be the foundation when trying to determine if an ICT-platform can be implemented and assist project work at Volvo Group Trucks.

1.5 Research Questions

Three research questions were prepared to help approach the project, they are presented in Table 1.1. Below each research question is a brief explanation of why the areas were investigated. The last three columns show how the research questions were answered.

Table 1.1 Research Questions

RQ#	Research question	Pre-study	Interviews	Theory
RQ1	**How is practical project work carried out at GTO and GTT?** Due to the size of both GTO and GTT the research will only result in a general understanding of how project work is carried out. Some areas are more researched to find where and how project information is communicated.	X	X	
RQ2	**How is information communicated between GTO and GTT in project work?** From RQ1 not all communication is documented, but the documented communication will be analyzed and compared with theory to build a firm base that can be elaborated to support an ICT-solution.	X	X	
RQ3	**How can an ICT-solution support project work and collaboration at GTO and GTT?** Theory from the literature study on the advantages from an ICT-platform will be compared with the analysis of the improvement areas at Volvo.			X

1.6 Limitations

The total time for the project was 20 weeks. Due to the short time span, a complete observation of all branches in the organization and interactions within product and production development could not be documented. Therefore the ICT-solution will cover ad-hoc functions which help the collaboration between product development and production. We are aware that product documentation (e.g. CAD files, simulation results, engineering reports, applicable variant combination, etc.) is an important part of the project work and the communication between GTT and GTO, but this has been excluded from our scope.

2. METHOD

In the method chapter the methodology that was used will be explained, the chapter will also cover how the different methods were used.

The different method used and in which order is illustrated in Figure 2.1.

Figure 2.1 Method precedence chart

2.1 Methodology

The chosen methodology was developed over time with the underlying research questions in mind.

The project was conducted through an inductive qualitative research. Inductive research was chosen over deductive research to find out if the problem is an anomaly at Volvo. To do this, the improvement areas were inductively researched. This means that the results were verified with theory. A deductive approach would do the opposite, verify the theory or a hypothesis if it is applicable to the real world. The difference is illustrated in the picture below. (Bryman & Bell, 2003)

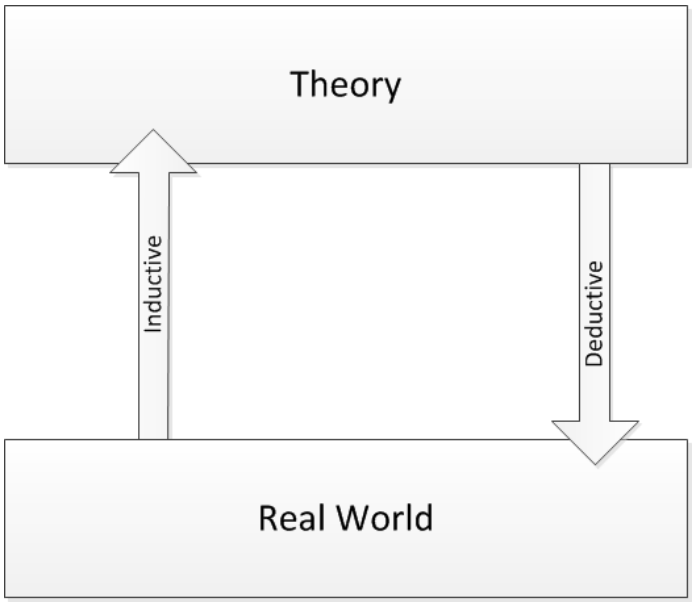


Figure 2.2 Difference between inductive and deductive reasoning

A quantitative approach was not chosen because it only answers the problem from an objective stand point (Bryman & Bell, 2003). This thesis tries to determine how the practical work is carried out. Therefore a qualitative approach was more suitable.

The empirical findings from the pre-study and the interviews were analyzed to find patterns and compared with theoretical findings.

2.2 Pre-study

In order to understand the current situation at Volvo Group Trucks a pre-study was conducted to study the areas which would be or could be affected by implementing an ICT-platform. The article from (Orlikowski, 1992) argues that a pre-study has to be performed. If a study is underestimating the current situation at a company, it may result in an incomplete prerequisite for an implementation of an ICT-platform.

The current project processes at GTT and GTO were studied which are called DVP and PSM respectively. The study consisted of reading the manuals for both DVP and PSM, this included research in the Project Assurance Plan (PAP), Project governance tool (PGT) and Standard time plan (STP). To collect more information and understand the structure of K4C a presentation was held by the developers of the platform. A project plan was coded with the JSON format, which is based on XML, partly to obtain practical knowledge on how an ICT-platform could be used and also how it can be structured. The project plan was then imported into the K4C-platform. A simulation was done of the project plan preformed from the CPM (Chief Project Manager) perspective. First, the project plan was implemented and the right expertise (engineers, reviewers and Project Managers (PM)) was dedicated to each activity in the project plan. The project plan was then sent out to a virtual PM who appointed resources to each activity; the resources had to have the right expertise to be appointed to the activity.

2.3 Literature study

A literature study was conducted in two phases, in the pre-study and while performing the analysis. The first of the two can be read in chapter 2.2. The later was made to get up to date knowledge of the subject investigated and to help with the analysis of the data collected.

2.4 Interviews

The interviews were conducted through semi-structured interviews. In most cases the interviews were audio recorded and after each interview the recordings were transcribed.

Semi-structured interviews were chosen over structured interviews, this was made in order to get more subjective answers and in turn get more information on what the interviewee thought was important in the surrounding areas of the questions (Bryman & Bell, 2003). A structured interview was not chosen because it aims only to answer the question asked and the interviewee is not allowed to talk about other concerns (Bryman & Bell, 2003). This resulted in two problems. First, the interviews were conducted to get a general understanding of how project work is carried out at different positions at GTO and GTT, including problems that concern the interviewees in their daily work. Secondly, when the interviews were constructed the interviewers did not have enough experience to construct aimed questions. It could be argued that the last interviews were more tilted towards structured interviews than they were in the beginning. An explanation of why it was structured like this can be found later in this chapter.

After the recordings had been transcribed they were deleted according to the agreement set by the interviewers and the interviewees. A total of eleven persons were interviewed at ten different occasions. The interviewees' positions, occupancy and organization can be seen in Table 2.1.

Table 2.1 Interviewees

Nr.	Occupancy	Position	Organization
1	Quality assurance	PM	GTT
2	Project PM	GTO PM	GTO
3	Project PM	PM	GTO
3	Project Portfolio Coordination	Engineer	GTO
4	Cross-Functional Coordinator (Commodity, Product)	PM	GTT
5	Project (Commodity) PM	PM	GTT
6	STP – Time Planning	PM	GTT
7	Tooling	PM	GTO
8	Intro Engineer	PM	GTO
9	Technical Designer	Engineer	GTT
10	Technical Preparation	Engineer	GTO
11	PTM	CPM	GTT

In Figure 2.3 an organization chart visualizes which departments that were interviewed (red boxes), the red line is the communication channeled between GTT-chassis and GTO. A more elaborated chart can be found in Appendix B.

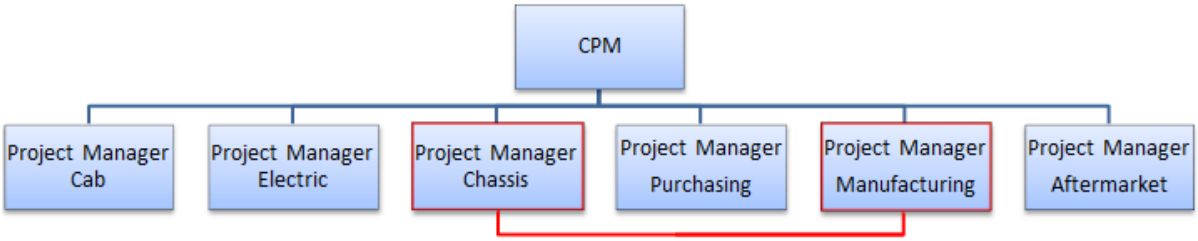


Figure 2.3 Visualization of the interviewed departments

The communication between GTT-design and GTO and the internal communication studied can be seen in Figure 2.4 below. The red marked communications are external communications from GTO, The blue and black lines are internal communications that were documented. The non-filled boxes are departments that have not been interviewed, which makes the communication path only verified by one partner.

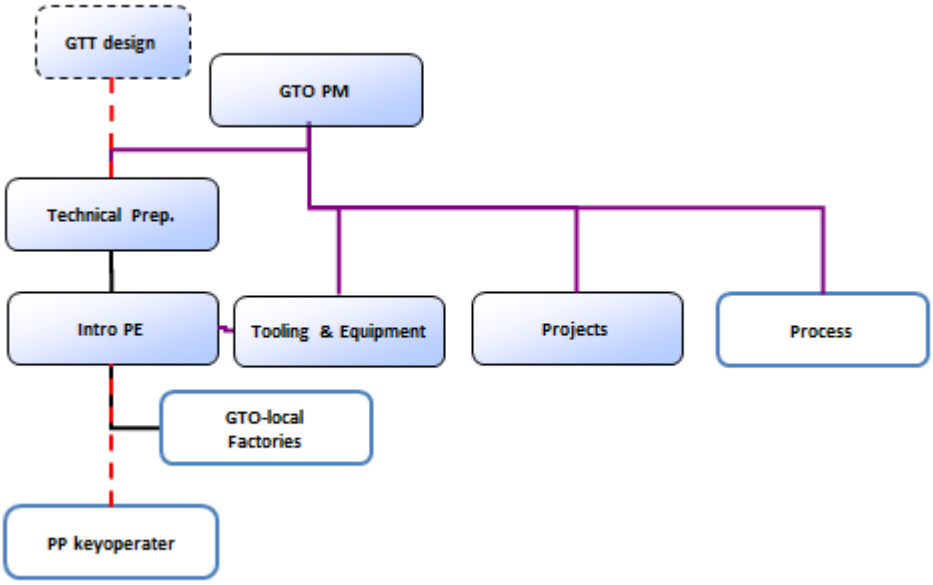


Figure 2.4 Internal communication at GTO including external communication

The interview questions were adapted to the specific occupation and position of the interviewee. In appendix D the general questions can be found. These were different for interview sessions six and ten. This was due to the information gathered consisted of background information and deeper knowledge of how the Standard Time Plans (STP) were used and how a new Project Time Management (PTM) program worked. After each interview a walkthrough of the questions were performed to estimate how well they worked, which in

some cases lead to minor changes. The alterations mostly consisted of collecting more information about a specific subject or clarifying the questions. As stated earlier, these questions could be seen as structured, still the interviews were conducted in a semi-constructed manner.

2.5 Analysis

When all interviews had been conducted two areas were separated: general project work and improvement areas. General project work is presented in chapter 4.1 and 4.2 in the Empirical Findings chapter improvement areas can be viewed in chapter 4.3. The general project work is a combination of the pre-study and information collected in the interviews and answers of RQ1 and RQ2.

Improvement areas were found through the interviews where problems or concerns was brought up by interviewees and then put into an excel sheet. Each improvement area was labeled into five categories and merged into a second excel sheet, see Appendix A. The categories were: Communication, Documentation, Knowledge, Resources and Gates. In the chapter 4.3 Improvement Areas in Empirical Findings, improvement areas that resembled each other or were identical were merged into one single problem. In the analysis the root causes are investigated with help of the theory found in the literature study. At last, the improvement areas validated by theory were compared with the advantages of an ICT-platform, see Figure 2.5. This was done to find out if an ICT-solution was applicable to the improvement area, which also answers RQ3. In the discussion chapter, comparisons between applicable ICT-solutions and the prerequisites for an ICT-platform are discussed.

Figure 2.5 Comparing results with the theory of ICT

2.6 Repeatability

The empirical data collection was performed with interviews and literature studies on the current state at Volvo. Two concerns are brought up on the repeatability of this thesis results. Firstly, the system is dynamic, changes are made in the organization and work procedures may change, which have an effect on the result if the study is to be repeated. Secondly, the people that were interviewed could have been affected by the interviewers like tone of voice or follow-up questions. If then another person would have interviewed them the answers could look different.

2.7 Validation

The empirical findings was gathered with scientific methods and then validated with theory found in the literature study.

3. THEORY

The theory chapter addresses the necessary theoretical framework to answer the research questions.

The theory found consists of (in order as they are represented); the interface between product and production, information about general projects, project management and the affecting management issues surrounding the improvement areas, the advantages and disadvantages of having an ICT-platform. The chapter ends with a theoretical chapter about change management. The project and management theory is from the book (PMI, 2013) which the DVP is based on.

3.1 Product development and production interface

A common characteristic for companies that have product development and production is the de-coupling of the two areas, which is done to minimize certain risks but may lead to integration issues. Earlier research has shown that cultural, geographic and organizational barriers have an impact on the interface between product development and production. This tends to make projects miss the target time plan where production start-up is pushed forward in time with other resulting problems i.e. rework of the design. Results from earlier research show that by improving the formalization, the understanding between product development and production will gain a smoother production start-up. Formalization may be both organizational i.e. having clear goals and giving roles and responsibilities to the right person, as well as having a standardized way of working and the use of formal documents. (Vandelvelde, 2003)

3.2 Project

The fundamentals of having a project model is to acquire a structured and organized work flow and by this capture important areas, variables and key functions that otherwise would have been overlooked. Each project, if finished, results with a unique product or service. A standardized project model will help achieve higher efficiency with work methods that are developed to be more effective and still support the flexibility to achieve a unique product. The flexibility of a project decreases over time where risks and uncertainty are high in the beginning of the project phase but will later decrease. This correlates with the cost of change, which increases with the total project time and thus the flexibility. This is illustrated in Figure 3.1. (PMI, 2013)

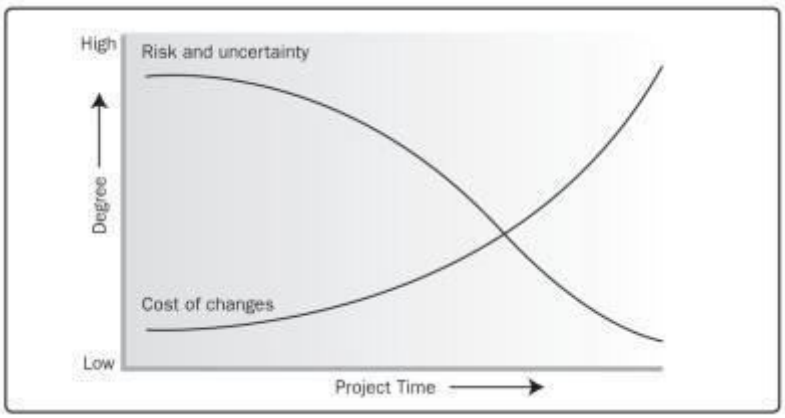


Figure 3.1 How uncertainty correlates with cost of changes (PMI, 2013)

A project can be standardized and efficient but it is also important to standardize how the handling of project results and how communication with other projects and organizations are managed. Lack of documentation and communication will result in important parts will misplaced. It is up to the manager to lead the project to success. The different parts described in the next chapter will highlight what makes a good project and how it should be managed (PMI, 2013).

3.2.1 Project Management

Project management is seen as several areas that affect the project, see Figure 3.2 (Rosenau & Githens, 2005). When a project is failing it is usually because one or several of these areas is not fully covered.

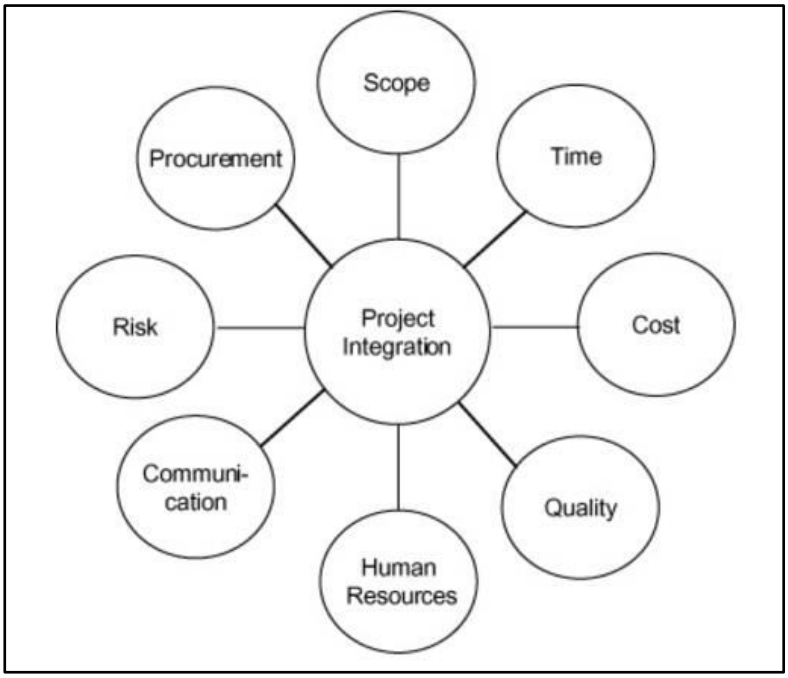


Figure 3.2 Fundamental areas in project management (Rosenau, Githens, 2005)

(Rosenau & Githens, 2005) mentions three common problems that occur when working in projects:

- Most product failure is at the interface of subsystems, and individual contributors typically do not pay attention to interfaces until after they have completed most of their work on their assigned piece of the system.
- Time and again, the biggest complaint of people in projects is poor communication.
- Senior managers expect project managers to manage projects as if they were a business, taking a strategic and holistic perspective on the project.

A successful project can be many things from how well deliverables were met, customer satisfaction amongst other. But what makes a project successful is how the different areas were handled and balanced between each other. The paragraphs below will bring up suggestions on how to handle these areas in order to make the project successful, all areas will not be fully covered such as risk and procurement. (Rosenau & Githens, 2005)

Scope Management

The amount of work that is needed to complete a project is defined in the scope. This also includes goals, constraints and limitations of the project. With a clearer goal early in the planning of the scope, it is easier to foresee each activity and the requirements of the project (PMI, 2013). When the scope has been defined, the deliverables can be described in detail and visualized as a work breakdown structure (WBS). The WBS can be made in several different ways, e.g. a precedence diagram can be used to see all deliverables in a logical order or a hierarchical diagram where activities are portrayed in a top-down approach. A general work breakdown structure with a top-down approach consists of four levels where the highest level is the project itself and then is broken down into deliverables of major components. The third level is more detailed and consists of sub-deliverables and the fourth and last are specific activities or work packages that needs to be performed, see Figure 3.3.

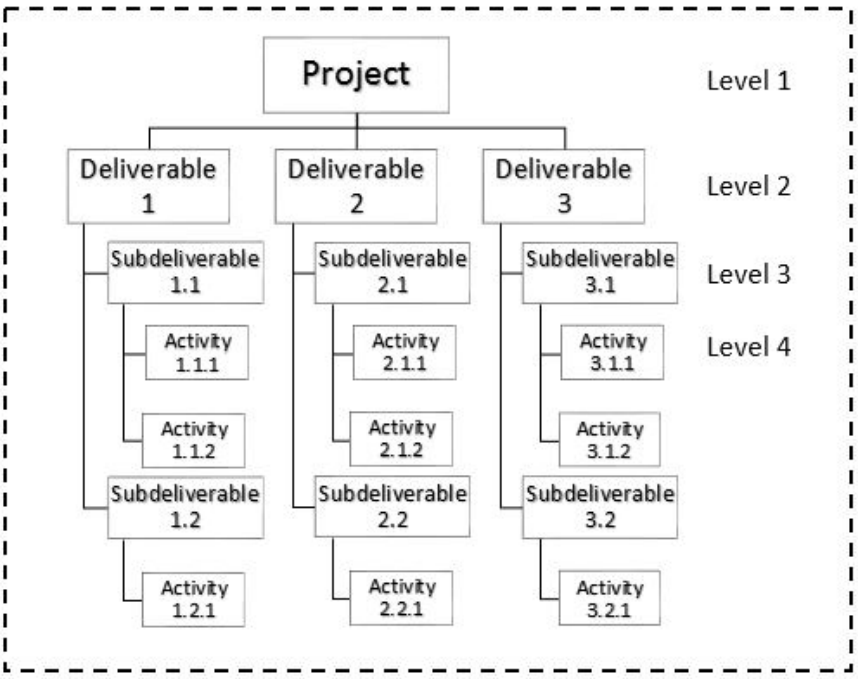


Figure 3.3 Work breakdown structure (WBS)

Communication

Communication is often subjective and a complex process. When working in a project it is important that the messenger is as objective and neutral as possible, that the receiver can translate what has been said without the sender's or receiver's personal thoughts affecting the message. (Ying & Pheng, 2014)

When a message is sent, the sender encodes the message and sends it over a medium, the message will be affected by noise. The noise can corrupt the message and alter its purpose. Another factor that can affect the message is when the receiver tries to decode the message. The messages meaning can affect the translation for the receiver, this communication is called one-way communication and is illustrated in Figure 3.4. (Ying & Pheng, 2014)

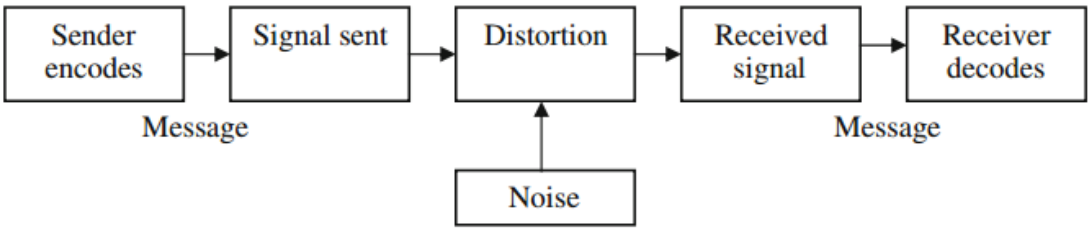


Figure 3.4 One-way communication (Ying & Pheng, 2014)

In two-way communication there is a higher chance that the receiver understands the message. The communication is viewed as a process where sender and receiver are exchanging information where both are active and receive feedback from each other during the communication period. The feedback acknowledges that the receiver has understood the message by communicating back to the sender. The process can be viewed in the Figure 3.5. In an organization the communication is often restricted to certain formats by the manager, this has a tendency to form how communication is sent and received. These formats of communication are debated, they do not take in aspect of how well the sender can distribute the message. (Ying & Pheng, 2014)

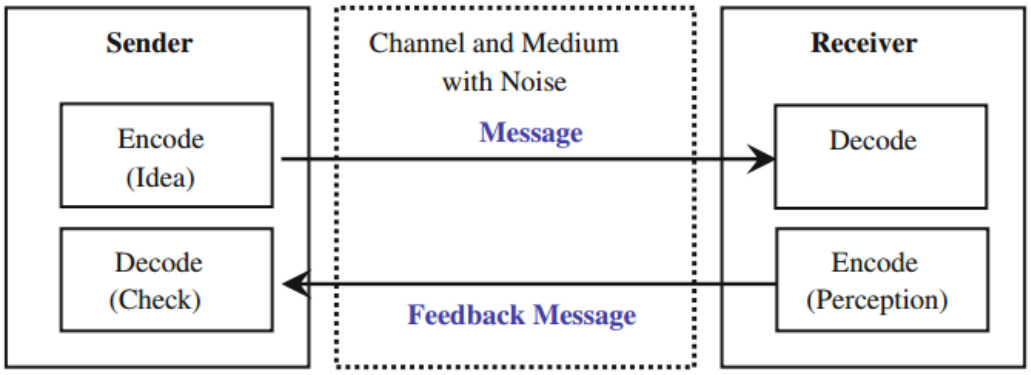


Figure 3.5 Two-way communication (Ying & Pheng, 2014)

For an organization to work properly it must be transparent for all stakeholders in the organization. If this is not the case, different parties will find their own communication channels, which will make it hard for the organization to effectively monitor the information flow. Organizations do not generally have a platform for which different stakeholders can communicate and this makes it even harder for stakeholders with different interest to collaborate. The effect of this is that the organization will lose control of what information is sent. Without understanding the information sent through the organization it is hard to control what is being sent and in turn how this is interpreted. (Ying & Pheng, 2014)

When a project lacks of poor communication it could be for several reasons. As has been mentioned before, modern technique with people trying to communicate with computers can be problematic if the message is interpreted differently than what it was intended. Eye-to-eye contact usually facilitates this issue. Another example may be that people are unwilling to share their information and sees it as a source of power. It could also depend on people not knowing the structures within the project or cross-functional problems where technical language is not perceived properly in other departments. (Pinto, 2007)

Information and Knowledge management

When handling information in projects it could either be structured data or unstructured data. If the data is structured it can be stored in rows and columns and if it is unstructured it could be different files like pdf's or emails. When data is unstructured it cannot be stored in a database in the same manner as structured data can, which leads to difficulties when trying to retrieve it due to the complexity of identifying the data itself. Project management data is usually unstructured and saved on a network based platform. (Eds. Somasundaram & Shrivastava, 2009)

To make this data easy to find there should be standardized guidelines and work instructions on how to store this on the platform. During a project, the ability to update documents is a key feature that will facilitate the work. When a document is updated, a notification system should be implemented so that all the stakeholders know an update has been made. (PMI, 2013)

The maturity level of the project management shows how standardized and structured a company is when working in projects. Higher level gives a higher degree of standardization. This could be used as a measurement for companies that want to benchmark its level of standardization. (Pinto, 2007)

Knowledge management is a factor in global companies to execute successful projects. Knowledge could be described as data that has been processed by people with experience and is useful for others in a company. To make use of the acquired knowledge in later projects, a knowledge database should be established, known as lessons learned log. Knowledge is usually divided into explicit knowledge, which is formal knowledge of different subjects. Tacit knowledge on the other hand is knowledge combined with experience and hard to transfer between people. According to earlier research, knowledge management can be described as the four processes seen in Table 3.1. A company that has several projects in its organization triggers different mechanisms depending on what the project incorporates. The mechanisms can be facilitated with different technologies as can be seen from Table 3.1. (Becerra-Fernandez, 2006)

Table 3.1 Four processes in knowledge management (Becerra-Fernandez, 2006)

Processes	Examples of Mechanisms	Examples of Technology
Discover new knowledge	-Meetings -Collaborative creation of documents.	-Video-conferencing -Databases
Capture existing knowledge	-Prototypes -Learning by doing.	-Lessons learned log database -Computer-based communication
Share knowledge with others	-Presentations -Manuals.	-Expertise locator system -Web-based access to data
Apply knowledge	-Hierarchical relationship in organizations -Support centers.	-Resource planning system -Decision support system

In a cross-functional global company, ICT is competent to share knowledge and information as long as it is easily accessed and updated regularly. This will be further elaborated in chapter 3.3. (Coakes, 2006)

Resources

Resource management includes how the project team is managed. People with varied expertise are assigned roles, authorities, responsibilities and competences and the amount of time one set off to the project. Resources can be replaced while the project is in progress at any time, but it is beneficial to have the same team as early and as long as possible during project execution. When a project team is put together, there needs to be team members with different background. It is also beneficial to have a project leader that has a certain amount of experience from earlier projects.

There are different tools available when managing the resources. When planning a project a hierarchical-type chart could be used. This shows the organization in a structure chart, which gives a holistic view of the teams and the relationships in between. Each box with several project members could be seen as a group. When a Work Breakdown Structure (WBS) has been made to show the project deliverables, an Organizational Breakdown Structure (OBS) could be made as seen in Figure 3.6. This is used to show the deliverables each department and teams are responsible for. Then there is a Resource Breakdown Structure (RBS) which is a hierarchical list of resources including a detailed description of each resource. This can be connected with the WBS and facilitate planning, monitoring and managing costs. Another type of chart is the Responsibility Assignment Matrix (RAM). This takes all the activities into account and connects them to each resource in a matrix based chart. (PMI, 2013)

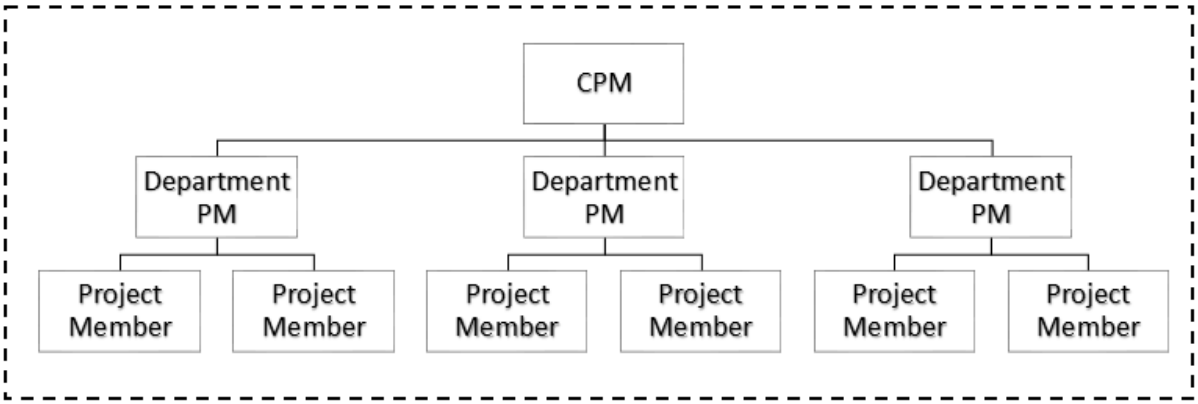


Figure 3.6 Organizational Breakdown Structure (OBS) in a project

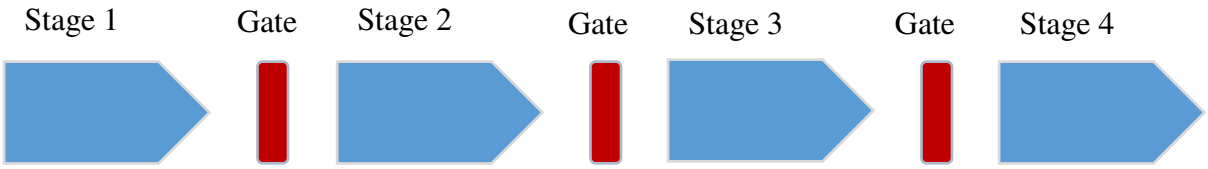
Due to people having different chemistry among each other, conflicts are inevitable. How successful a project manager is when managing the project often depends on their ability to resolve conflicts. There are five different techniques for resolving conflicts that project managers or project members could use (PMI, 2013):

- Avoid
- Accommodate
- Reconcile
- Force
- Collaborate

The conflict may be resolved with the techniques but the core problem may still persist. If there are personnel problems that cannot be solved with the techniques, the project manager preferably needs to have argumentation convince top management that some of the personnel need to be replaced. (Pinto, 2007)

3.2.2 Stage-Gate

Around the late 1980s and the early 1990s a new concept was needed to handle the new paradigm shift for the commercial product development. Before the 1990s there was no need of fast development of products, but in the 1990s this changed. The market demanded higher customization and more variations of products. One model that emerged was the Stage-Gate model (Cooper, 1990). The Stage-Gate model has different stages were specific activities are being carried out by all stakeholders, after each stage there is a gate. The purpose of the gates is to check that all deliverables have been completed and that the project can proceed into a new development stage, see Figure 3.7. The idea is to include resources in the beginning of the project to minimize the increased cost of a fundamental change later in the project (Anderson, 1993). In the earlier phases managers review the progress of the project and at each gate grant more funds to the project if the criteria's are fulfilled.



Figur 3.7 Stage-Gate model

One successful adaptation of the Stage-Gate method was done by the companies Corning Glass and Nortel Networks. Corning Glass had a difficult time during the IT-crash in the 1990s, they did not have continuous product development and had lived on one innovation at a time. They adapted the Stage-Gate model on top of how they successfully developed products earlier. The different stages Corning Glass brought forward can be seen in Table 3.2 (*Stage-Gate product development*, 2012)

Table 3.2 Description of the different stages in the Stage-Gate model

Stage	**Process**
0	Discovery of new opportunities including the development of product ideas by the project management team.
1	Scoping through a basic evaluation and assessment of the marketability of a new product idea. Product ideas are assessed based on known competition and the product's competitive advantage.
2	Developing a business case based on careful research that details why a product will succeed. During this stage the product is defined, milestones are established and each department assesses the product's feasibility.
3	Development focuses on the product design and the development of prototypes.
4	Testing and validation, both in house and in the field with consumers. Trial sales efforts are conducted to measure both the product's functional and market performance.
5	Product launch.

The Stage-Gate model has since been further developed and implemented in different companies e.g. Volvo Group Trucks with their product development process, DVP. How many gates there are and what type of stages depend on the company's development process (Anderson, 1993). By adopting the Stage-Gate model, companies aim at lower development cost and to get products faster on the market (Anderson, 1993).

Through the years the Stage-Gate model have been modified to help overcome some of the criticism that has been directed towards it. (Grönlund, et al., 2010) states them as following:

- Time-consuming, resulting in timewasting activities
- Bureaucratic procedures
- No provision for focus
- Restriction of learning opportunities

The four presented issues could occur in a Stage-Gate model.

3.3 ICT/Collaboration network

ICT stands for information communication technology and is a concept on how information and communication management can be facilitated.

Different concepts are used to achieve more efficient development projects, such as restructure of the organizations, project models and management tools. The idea with ICT is that it tries to merge the different concepts. It can be a management tool but also a platform for other means such as communication and data sharing, for example extend collaboration between countries and organizations for educational purposes (Khakhar, et al., 2007).

This chapter will highlight the ICT concept adapted for manufacturing companies where great advantages can be made with a well-functioning ICT-solution. The concept of ICT and what it tries to accomplish reflects what internet has to offer; collaboration and flexibility with shared resources (people and data) and openness.

One aspect that differentiates the two areas is the view on communication. Internet is based on horizontal communication, which means that there is no hierarchical structure, meanwhile ICT solutions have a tendency to use both horizontal and hierarchical communication (Duque, et al., 2007).

Manufacturing companies are expecting that they need to develop technologies such as ICT-platforms in the upcoming future to help them stay competitive on the market. (Marco, Montorio, 2007)

(Camarinha-Matos, Afsarmanesh, Ollus, 2008) addresses what manufacturing companies can gain from an ICT-solution with a collaborative network. Customers in the list below can be interpreted as different stakeholders at different departments in a project:

- Business partners can quickly and easily get together to benefit from a business opportunity, fulfill the need and then disclose the collaboration.
- Increasing applications in early stages of product life cycle, speeding up and giving more efficiency to engineering and design.
- Increased customer collaboration and logistics enhance market understanding and reduce delivery times and times to market.
- Customer collaboration in after delivery networks enables new form of support activities over the life-cycle of the delivered product or service.
- Efficiency relies on capability for companies to co-operate despite different infrastructures, business cultures, organizational forms, and languages, legal or fiscal systems.
- Business networks themselves continuously change.

To accomplish the effects mentioned above there are several criterias that need to be met to build a firm base which an ICT-solution can stand on. Much of the research in ICT has surrounded areas with ad-hoc solutions, meanwhile the understanding of collaborative research has been missed. The collaboration is often surrounded by architectural flaws in most systems, where several different tools or software are used, several different communication channels and differences between organizations, makes it hard to implement an ICT-platform. To effectively establish a base for an ICT-platform, the different infrastructure needs to be customized to fit into a coherent platform. This customization requires highly skilled engineers who have knowledge in applications. (Camarinha-Matos, Afsarmanesh, Ollus, 2008)

(Rabelo, 2008) states the following three preconditions have to be set to be able to implement an ICT-platform.

1. Requires collaboration among involved partners that does not only involve sending e-mail messages.
2. The existence of trust, considering that partners shall rely on each other (at all levels).
3. All (or most) of the activities carried out within a collaborative network organization should be made via computer networks, i.e. digital transactions should be the routine, and not an exception.

(Rabelo, 2008) also states that organizations need to be transparent and adaptive to facilitate the implementation of a communication and information channel in the current state of the organization. By having all of the mentioned requirements, people using the ICT-platform will see it as a must have and not as an optional tool. To complement the technology of the ICT-platform, the platform requires powerful computer power and high internal and external security.

In chapter 3.2.1 four processes were mentioned and to have the most efficient use of knowledge in a company, all four of these processes should be managed efficiently. An ICT-platform would greatly facilitate knowledge management in a company. If the platform has embraced all four of the processes it will be a more standardized way of working. Explicit knowledge can be managed with structured databases, and tacit knowledge can be managed by socialization like meetings and video conferencing. Although a platform that manages tacit knowledge is hard to implement due to the difficulties of documenting experience. (Becerra-Fernandez, 2006)

When a company has implemented an ICT-platform there are both positive and negative sides when it comes to conflict management. A case study (Correia, 2008) has shown that an ICT-platform facilitated conflict management by having an effective and formal way of communicating. On the other hand the ICT could also aggravate conflict due to different personalities of the communication participants, where misinterpretations could occur.

3.4 Change Management

If a new work method or technology is implemented in a company, people are the primary factor in either success or failure in achieving the change. If people are positive to the change it is easier to implement, but if they do not support the change, it could be due to several causes.

(Suran, 2015) mentions three important factors on how to implement change successfully. First the company needs to have a clearly defined strategy of why a change is necessary and that it is understood by all departments and teams. If the strategy is not communicated well people tend to fear the unknown of what consequence the changes may bring for themselves. Another factor mentioned is to have an effective organizational structure. If a company has its organization divided into teams, competitive attitude may grow between them which may prevent sharing information. The third and last factor mentioned is to have effective processes and communication processes. This leads to trust among the employees towards the management because the process assures a consideration of their ideas for different changes.

If a company has met the three factors, the next mission is to get employees to accept the change. Convincing employees may be hard, but if the right information is communicated in a way that benefits the company and workers are inspired, the change will be easier to implement. It is also important to listen to the employees and let them test the new changes in a real situation and then let them make suggestions on how the change can be more effective in their daily work. Furthermore it is important that top management shows a specific way of how the change will be implemented that everyone understands. Factors to successfully implement change and how to achieve employee acceptance of change, is summarized in the lists below. (Suran, 2015)

Factors to successfully implement change
1. Clearly defined and communicated strategies.
2. Effective organizational structure.
3. Effective processes, including communication processes.

How to achieve employee acceptance of change
1. Convince employees of the need for change.
2. Listen to employee concerns and needs.
3. Involve employees in the development of the change.
4. Communicate the implementation plan.

4. EMPIRICAL FINDINGS

As explained in the method chapter the results will be divided into two groups. The first part presents the current state at Volvo and the tools used can be found in Appendix C. This includes how people communicate in projects and a generalized summary of how a product development project would be carried out at Volvo Group Trucks. The second part of this chapter consists of improvement areas which are divided into five parts; Communication, Documentation, Knowledge, Resources and Gates.

4.1 Current Process and Tools at Volvo

There is a range of different project types at Volvo besides the product development projects. Generally a large product development project is called Start cost project.

Start cost projects has four different scales A, B, C and D. Scale A has the longest lead time and scale C has the shortest. Scale D is called Intro-block. The purpose of an Intro-block is to bundle and prepare the production for the implementation of new product changes. The product changes are implemented at specific dates and follow a specific time plan. The major difference between a Start cost project and an Intro-block project is that the former is used when developing a whole vehicle or powertrain and the latter is used when bundling a set of product modification requests. Product Modification Request (PMR) is a project which is issued by customer request; they are smaller than Start cost projects and are implemented in the Intro-blocks.

The creation of a Start cost project can have several different triggers. It can either be based upon customer demand or legislations. A reoccurring phenomenon while forming the project is that it starts off with a requirement and during the process, new issues occur. New technology is needed to be able to meet the requirements. Over time more problems are detected which expands the scope of the project.

There are two kinds of quality notification and assembly systems that handle issues, called System A and System B, see Appendix C. In general they are not regarded as projects but if the issues affect the production or product at large they can initiate a project.

4.1.1 DVP

DVP (Develop Product and Aftermarket Product Portfolio) is the project model GTT follows. This originates from the Stage-Gate model and is adapted for Volvo Group Trucks's product development. Before the DVP, an older process was used called the GDP (Global Development Process). Only recently started projects use DVP as a model, while older active projects still uses the GDP. The DVP comes with a handbook that describes principles that the management should follow like, quality assurance, cross-functional teams, how to plan the project and prove the project is feasibility amongst other. The handbook also addresses all aspects of a product development project like, starting a project, organization, planning, risk management, decision making etc. The DVP is in close correlation with PGT, PAP and the Standard Time Plan. A more detailed description of the three will be brought further down. The amount of gates and stages depends on the particular project, how large it is and what it

contains. A new initiative has been developed to increase resources in earlier stages of the project. This initiative is called RnD30.

4.1.2 PAP and PGT

Project Assurance Plan (PAP) is a tool in projects that help state and review deliverables for the gates, plan the next gate and view the project description to see if it meets the QDCF principles (Quality, Delivery, Cost and Feature). The gate "process" is visualized in Figure 4.1. The deliverables are predefined at each gate in a template by the CPM and PMs, and the amount deliverables varies with the different sizes of projects. The PAP also includes documentation of project definition, project time plans and white books.

The Project Governance Tool (PGT) is a web based software connected to PAP and aids the Steering committee (SC) in taking decision of opening gates or not. It also works like a gate auditor to view the status of the project and project team where monitoring the progress and information of what the next deliverable or agenda consists of. Only certain persons have access to the projects PGT, this access is given by the CPM of the project.

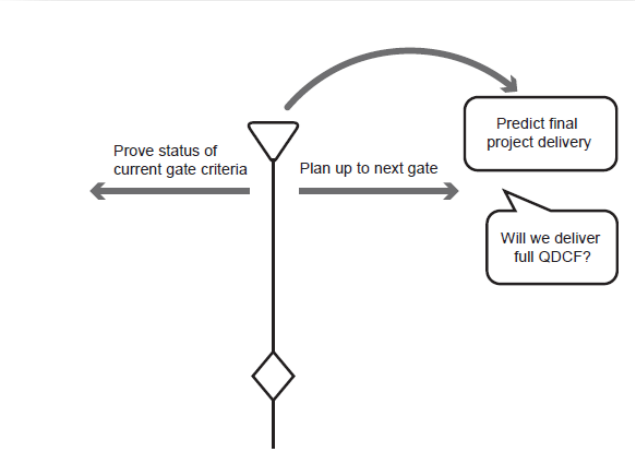


Figure 4.1 Gate process

4.1.3 PSM

The Project Steering Model (PSM) is a general project model, which is used for industrialization changes in process and business projects carried out at Volvo Group Trucks Operations. The model consists of a couple of different principles for example roles and responsibility, documents and governance. Another important principle is the PSM Flow, which is a flow chart showing phases and gates in a project. This helps the project team to focus on a certain activity and assisting the steering committee to make important decisions at a certain time. The earlier project process, GDP, had been successfully aligned with the PSM process. When asked about the issue during the interviews, an example of how the GDP and PSM could be aligned was showed. This has not been performed for the DVP, where the explanation is that the DVP model is too new and not enough experience to construct an alignment model.

4.1.4 Time Plans

What time plan to use depends on the grade of the Start cost project: A, B, C or D.

Start cost projects have one main time plan where all stakeholders are included. The time plan is a template that gives all stakeholders a visualization of the whole project in form of a Gantt chart. Start and end dates, gates, critical activities and stakeholders are highlighted in the Gantt chart.

GTT has 4 levels of time plans and different responsibility areas as can be seen in Table 4.1.

Table 4.1 Time plan levels

Level	Area	Responsibility
1	Main Time Plan	CPM
2	Commodity time plan	PM
3	System/Module time plan	Sub-PM
4	Component/Part time plan	Team Leader

GTO does not follow the same levels of time plans as GTT, instead their PM creates a level 2 time plan to suit the main time plan (see chapter 4.1.3). The level 2 time plan is adapted to fit both the DVP process and the PSM process. The different departments at GTO may construct more levels of time plans but are not directly connected to the different levels of the main time plan.

To create time plans, different tools are used depending on personal preferences. CPMs can require PMs to use a specific scheduling tool for their level two and three time plan. Either Microsoft Project or Excel is used. A new tool has been developed for handling standard time plans and is called PTM (Project Time Management). This is an ICT-tool where each time plan is linked, and when one is updated the other ones get notified. The one responsible for the time plan can accept or decline the update. It is also supposed to help people in projects that are not CPM or PM to have access to a web based visualization of the time plans and their status.

4.1.5 Communication and Documentation

The communication at both GTO and GTT are performed through PGT, e-mail, Microsoft Share Point, Lync, meetings and by phone. PGT is used in direct correlation with deliverables and gates, where templates are stored at each activity that has to be done before certain dates. E-mails are regularly sent for different reasons, often with unstructured data, where it can vary from new emerging problems to sending new documents. Microsoft Share Point is the main platform to store all the important project documents like project description, time plans and organization charts. Lync is used both in online meetings and to send messages to concerned people. How people interact and what tools people prefer to use for communicating are up to each person or group. Closed projects and their descriptions, including white books are saved in a database called System C, see Appendix C. Product changes are sent through

System F and affected production changes is sent through System E, see Appendix C. The data is of structured nature in both systems.

At GTT Chassis, there is an ad-hoc manual for how to work in different roles and what knowledge is needed for a role, but it has not been updated for years.

4.2 A General Concept of Project Work in a Start Cost Project

This paragraph will highlight certain parts of a Start cost project. The whole organization or all information in such project is not presented. What includes is the information about project work gathered from the interviewees. Each of the interviewees has different tasks and method while working. This concept has merged all interviews to try to visualize how the different interviewees are connected. Figure 4.2 gives a general illustration of how the different information and communication flows between GTT and GTO are connected.

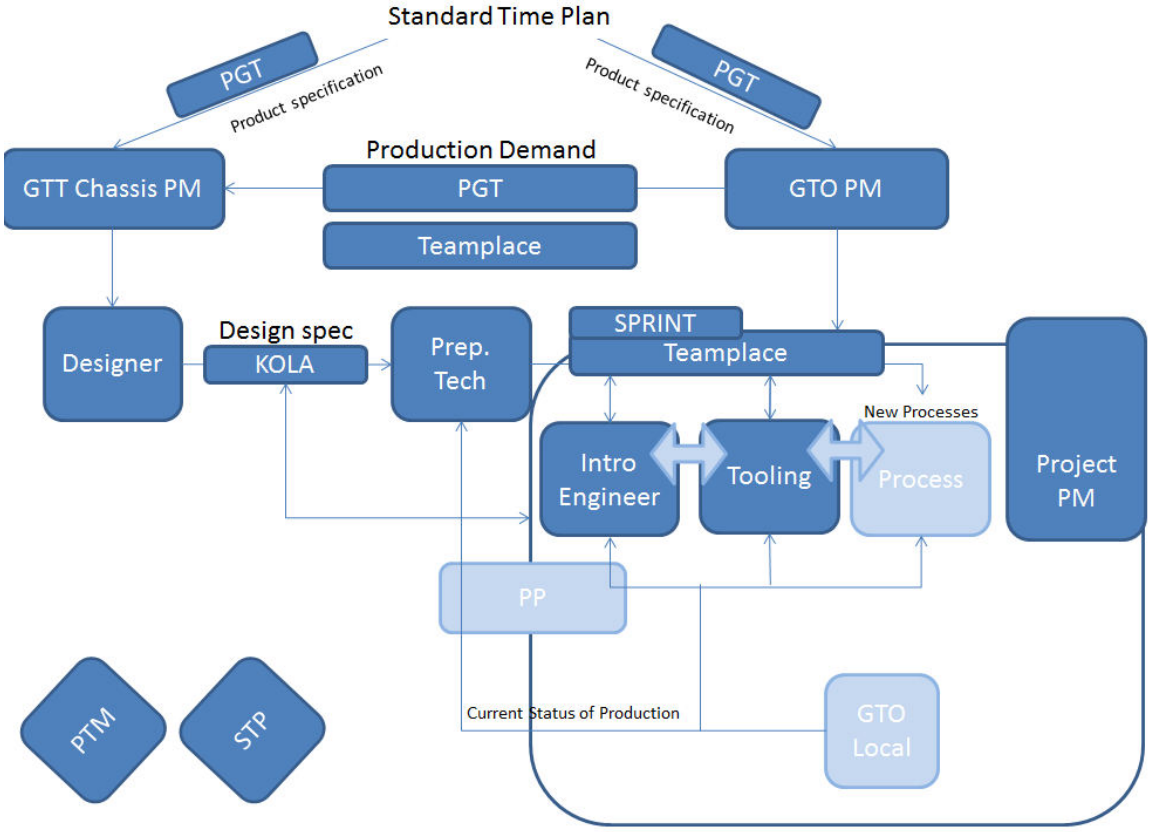


Figure 4.2 Information and communication flows between GTT and GTO

Product planning generates a Start cost project based on customer demand. Product planning then sends out prerequisites of the product to the CPM. The CPM then gathers PMs on the different departments that are affected by the project and a concept is developed to meet the specifications of the product. Each department then creates a business case, to calculate the cost and then sends it to the finance department. If the product change is financially viable the request is accepted.

The business case results in demands from the stakeholders e.g. production (GTO) and aftermarket. The demands are distributed via PGT and are discussed through meetings. The demands defines the product's shape and attributes, this is necessary for different reasons and depends on who the demands originate from. It could be GTO who wants the product to be easy to assemble, it is then up to the GTO PM to collect information from relevant actors within GTO and bring it to the CPM of the Start cost project. Each factory does not have the same production requirement which leads to different demands. This is where intro engineers' helps with the merging of the demands to fit a common tool and production system.

The CPM structures the standard time plan to fit this particular project and in turn sends the time plan to affected PMs, who then create a level 2 time plan. The time plans are discussed at meetings, in some cases a physical time plan is saved on a whiteboard. In the earlier stages of the project all PM's meet every two weeks to discuss deliverables and how the project is going compared to the standard time plan. It is up to the individual PMs to choose what the time plan is based on and what tools they use, for example Microsoft Project or Excel. At GTO, PSM has to be adapted to fit the gates with the product project.

The product matures during the development loops, which have been added in the DVP to increase time and resources in the earlier phases of the project. There are a total of eight development loops, where each loop begins with the same prerequisites and demands as the previous ended with. Development loops help departments to have similar understanding of the product and ensures that they all are on the same level of knowledge in the product specification. The different departments are generally in different stages in their own development process, where development loops help their own development to be more aligned with the standard time plan.

When a loop is completed the product is "frozen" and no more changes are allowed until the next loop. Designer and technical preparation has to have a meeting if a change is made to a product. If a change is made it will be noted by changing the article number of the product in System F. Intro engineers then implement the changes into the master structure System E. They are sent to the factories through target structure System E which they in turn alter to fit into their production system. All factories have an Industrial Launch Group (ILG) which through meetings verifies that all activities have been performed in all local departments and suppliers.

The first gate the project needs to pass is the feasibility gate, during the feasibility and concept phase the product is developed during the previous named development loops. After the concept gate it is no longer allowed to change the products specifications. GTO gradually gets more involved the further the project proceeds, primarily based on the maturity level of the product. Technical preparation is the main actor from GTO in the earlier loops, intro engineering takes on a larger role after the concept gate and tooling and equipment gets more involved when a production change is under development. The sooner information about the product reaches GTO-regional and local, the earlier they can plan and change the production, for example contact suppliers for tools and equipment, give assembly instruction that the factories can implement into their production.

GTO gathers information from the project in two ways. Firstly, communication between designers and technical preparation consists of updates on the design and information surrounding the demands from GTO, the information is not new but more detail and specific.

Secondly, technical preparation distribute information to tooling and intro engineering on which updates are ongoing and they also take notes from mentioned departments on how the production will be affected by the changes.

New vital information is gathered by the GTO PM who shares it with GTO local and regional departments via Microsoft share point. This is done regularly each week with included meetings. A Start cost project does not always affect the whole production. In the beginning of the project it is usually small, but grows larger over time with new information, and due to this it can go from a line organization problem to a project at GTO-regional.

The Final Industrialization Gate (FIG) is an important gate; it verifies all aspect of the production instruction, assembly sequences, lead times etc. The verification of the product has been performed at Final Development Gate (FDG) and is GTT's responsibility. The verification is primarily done at the Pilot Plant (PP), where the product's manufacturability is tested. Simulations of the assembly sequence are also done but only around 80% of all variations can be verified, this is primarily because of the large amount of variants. When the project has gone through the Release Gate (RG) the series production can start and the responsibility of the product is handed over to GTO-local with support from intro engineering if needed.

4.3 Improvement areas

The improvement areas are concerns mentioned at the interviews, see Appendix A. Under each part a summary of the reoccurring improvement areas that were mentioned and the highlighted words in the chapters is the subject of each paragraph.

4.3.1 Communication

There is no **group management** to secure that all e-mails are sent to the right people. When PM or CPM sends out important emails to all stakeholders there are usually a lot of e-mail addresses to handle manually. This could sometimes lead to emails not getting to the concerned persons who then can miss important information, meetings, etc. (see Appendix A, C1.1, C1.2, C1.3)

The **project management** can sometimes be time consuming when the project grows and changes line organization or when several projects are merged. The communication between all stakeholders is crucial for the different departments so that delays can be minimized. (see Appendix A, C2.1, C2.2)

When it comes to the communication between GTO and GTT it is important that information between product development and production is **transparent.** This is not always the case which may lead to time plans getting out of sync between departments and projects might be delayed. Also when departments are isolated due to holding information within its walls, time consuming activities appears and may cause frustration and less value adding work time. When concepts are changed late it is important that all stake holders get the information fast, otherwise project costs may increase due to expensive long lead time tool development. At the moment there is only one person that tries to extract information from the product

development to maintain a fast response to changes. (see Appendix A, C3.1, C3.2, C3.3, C3.4, C3.5, C3.6, C3.7, C3.8, C3.9, C3.10)

The performance of the project has a lot of factors, where one could be **people chemistry** and how the interaction between persons may be carried out. (see Appendix A, C4.1, C4.2, C4.3)

4.3.2 Documentation

There are several **inconsistencies** when handling project files like storing data, updating data and where to find manuals (see Appendix A, D1.1, D1.2, D1.3, D1.4, D1.5, D1.6, D1.7). This could lead to confusion and time consuming activities due to people having to search for the right documents for their project. Although some CPM's set rules in the beginning of a project to get more consistency (see Appendix A, D1.8). There are also problem with the **structure** of the project files, how the files are stored and their naming convention. There is also lacking gates alignment between DVP and PSM. (see Appendix A, D2.1, D2.2, D2.3, D2.4)

Project management is lacking when smaller projects are merged into a larger project, which takes time and resources, and people at GTO must contact the GTO PM to obtain the latest information about what product the project includes (see Appendix A, D3.1, D3.2).

It is hard to **visualize** the project plan and get a **holistic view** of the whole project (see Appendix A, D4.1, D4.2). It is important to have all stakeholders understanding the scope of the project and make it as clear as possible.

Having no **transparency** is a problem that usually occurs in projects spanning over several departments. It is especially problematic between the product development at GTT and production at GTO. When GTO does not participate in the development loops as they should and GTT does not have an understanding of the production, the departments may suffer from isolation that causes important information to be locked up. Due to long lead time tools that need to be ordered in time, an employee from GTO tries to obtain the information that is needed and thus break the isolation. It is also very hard to interpret the project in the beginning which makes it hard to start working with the production of the product (see Appendix A, D5.1, D5.2, D5.3, D5.4, D5.5).

There are no guidelines for a PM as to which tools to use, which makes the time plans in projects, end up in a lot of different formats. Moreover when files are in different formats it takes time to convert them into a convenient format which any program can use (see Appendix A, D6.1, D6.2).

When project members are replaced a lot of project **experience** may be lost, but it also makes it hard, if not impossible, to document experience. Intro engineers have a lot of **correlated projects** and they have to search for the connected impacts when a certain product change has been made. If a key project member is replaced it will cause problems due to the lost experience (see Appendix A, D7.1, D7.2).

When working in projects there are some administrative activities that are waste of **time** due to tedious way of working (see Appendix A, D8.1). Other time related issues are the Intro blocks. These are for the most parts movable if a problem occur, but there are some exceptions that are not moveable due to i.e. legal requirements like safety issues (see Appendix A, D8.2, D8.3).

There are ways to measure project quality and it is not that comprehensive, which means that the cost of the project is discarded, hence **priority** amongst the projects cannot be obtained. The ILG is responsible to verify and **assure** that all activities in a project have been performed and saves a status file at the Microsoft Share Point storage (see Appendix A, D9.1, D9.2).

4.3.3 Knowledge

An important factor when introducing new work methods is to **educate** people of why the change is necessary. If the information about the change has not been communicated as well as it should, people tend to fall back on the old and practiced way of working or use of tools. (see Appendix A, E1.1, E1.2, E1.3)

When it comes to the awareness of new project models, some project managers are not **aware** of the high workload in the beginning of a project. This leads to a time pressure throughout the project and may delay deliveries. (see Appendix A, E2.1, E2.2)

There is no clear information on why or how to use project tools like PGT or processes like DFA or PSM, which makes it hard to follow them. (see Appendix A, E2.3, E2.4, E2.5) Project managers may choose how the document **structure** should look like or how to follow a process which could lead to misunderstandings between stakeholders. (see Appendix A, E3.1, E3.2, E3.3, E3.4)

4.3.4 Resources

The project group members are usually dismantled after a project is finished. Reusing **resources** from a project that has worked well would facilitate the next project. When working with new project models it can be difficult to estimate the time it takes for each deliverable before each gate which leads to delayed projects. Searching for resources is usually time consuming and hard to find new resources when a team member has left a project. Solving a problem can be done faster if the right expertise is found as fast as possible. (see Appendix A, R1.1, R1.2, R1.3, R1.4, R1.5, R1.6)

Due to the amount of people in projects that span over several departments, the CPM or Intro engineer could miss contacting all the stakeholders within the project **group**. The organization charts are made in a PowerPoint-file and has no connection to the e-mail client which is one potential improvement area. (see Appendix A, R2.1, R2.2, R2.3)

When it comes to different roles in a project the **people chemistry** is usually a performance factor that is hard to estimate before a project start. (see Appendix A, R3.1, R3.2)

It is also hard to get a **holistic** view of the project and all its stakeholders and when a project is late everyone needs to be informed. (see Appendix A, R4.1, R4.2)

4.3.5 Gates

Gates are an important part of project work. Since each project looks different from the other, the PM needs to have an opportunity to merge gates or adapt project plans when late product changes have been made. The cross-functionality in a project is important when different departments need to adapt gates with their process so that delays are easier to handle. (see Appendix A, G1.1, G1.2, G1.3, G1.4, G1.5)

5. ANALYSIS

This chapter includes an analysis to find differences between the theory chapter and the results chapter. A summary is presented in each improvement chapter in a form of a table. An analysis of the improvement areas and the correlating ICT advantages will also be brought up.

The project management and the different processes used currently at Volvo Group Trucks are a reflection of the presented theory; much of the theory is based upon the book (PMI, 2013), which in turn is regulated by the ANSI standard ANSI/PMI 08-001-2012. The DVP follows the Stage-Gate principle, though using their own concept of the method, and with RnD30 it also aims for more resources at early stages. Time plans are used throughout the organization in projects with the help of WBS and RBS. Inconsistencies concerning different kinds of communication and data handling has been detected, where there are no structured process, there are directives on how people should carry out the process but not all PM or CPM are consistent with following or demanding that they are followed.

Communication

As could be seen in the theory chapters there were a lot of different areas that needs to work to have a successful project. Communication is a complex part of the project work as can be seen in the theory. This also states that there are virtual communication methods that will facilitate at global companies. When comparing the theory with the result chapter it can be seen that there are some improvement areas standing out, like emails getting to the right people, transparency between departments and people chemistry. The areas and their correlation to theory are presented in Table 5.1. According to the theory it is important to have good communication between all the stakeholders when the project scope grows, which is discussed in the next chapter.

Table 5.1 Communication results validated by theory

Results	Theory
E-mails not getting to the right people.	People not knowing the structure of the project (Ying & Pheng, 2014)
Transparency leads to essential information not being communicated	When the organization is not transparent it has problem with distributing information (Ying & Pheng, 2014)
People chemistry leads to conflicts.	People having different personalities, conflicts are inevitable. (PMI, 2013)

As can be seen from the ICT chapter in the theory, an ICT may help with the two first issues. The first can be solved due to the hierarchical communication structure where people may be able to send e-mails to whole groups. The second could be solved as a result of the implementation of the ICT, where collaboration will be facilitated (Rabelo, 2008). The third is ambiguous due to there are both positive and negative sides with an ICT (Correia, 2008).

Documentation

When it comes to information storage the theory states that data can be either structured or unstructured. Most project data is unstructured and hence it is more convenient to be stored on

a network based storage platform. This can be confirmed by the results that the data is stored on Microsoft share point. Although, according to the results there are inconsistencies when storing data and what tools to use and does not comply with the theory. This states that the data should have standardized guidelines and work instructions in how to store it.

The theory states that it is important to have a holistic view of the whole project that helps all stakeholders understanding the scope. This is not the case according to the results, which shows that it is usually hard to have a visualization of the whole project. Transparency between departments is also an area that differs. The theory states that it is important for global companies to have a transparent organization, but the results shows that the production department may feel isolated due to the product development department not sharing important information in time.

Furthermore the theory mentions that when people are replaced in projects experience may disappear and this knowledge can for instance be saved in a lessons learned log. The results confirm that it can be problematic but also that it is difficult to document experience.

Table 5.2 Documentation results validated by theory

Results	Theory
Inconsistencies in naming conventions, file structure when storing project files and tools.	To make data easy to find there should be standardized guidelines and work instructions. (PMI, 2013)
Visualization of the project plan is hard.	It is important that all stakeholders understand the scope. (Pinto, 2007)
Isolation leads to less transparency between departments.	Important that global companies are transparent. (Pinto, 2007)
When people in projects are replaced experience may be lost.	Important to have a lesson learned log to document experience. (Becerra-Fernandez, 2006)

The theory states that a standardized document structure is vital for having an effective project work. ICT may facilitate all four issues but there is some interference that needs to be solved in advance which will be discussed in the next chapter. (Coakes, 2006) (Camarinha-Matos, Afsarmanesh, Ollus, 2008) (Rabelo, 2008)

Knowledge

Knowledge improvements in most cases revolve around methods not fully being implemented and enforced. Inexperience in project work and clear initiatives from CPM and PMs makes it hard for people to structure their work.

Table 5.3 Knowledge results validated by theory

Results	Theory
People are not aware of why a work method change is necessary.	Change management (Suran, 2015)
There is no clear information on how to use project tools.	There should be standardized guidelines and work instructions. (PMI, 2013)

When it comes to knowledge the theory mentions four processes that can be facilitated with an ICT (Becerra-Fernandez, 2006). The first issue in Table 5.3 is a change management type, where the next issue is of a kind that could be included into one of the processes.

Resources

The theory states that keeping resources throughout the project is beneficial. The result shows that when someone in the team leaves the project it is hard to find new resources and it takes time. The theory also states that when managing the resources several tools can be used for visualization of the organization or having an expertise locator system. PowerPoint is used according to the results to visualize the organization, but does not have a connection between the resource and e-mail client. This may lead to excessive work.

Table 5.4 Resources results validated by theory

Results	Theory
Project is dismantled after a project is finished and people can leave in the middle of a project.	Having the same team throughout the project is beneficial. (PMI, 2013)
When someone leaves the project it is hard to find new resources.	It would help to have an expertise locator system (Becerra-Fernandez, 2006).

As could be seen in the theory chapter 3.3, an ICT-solution could facilitate both resource planning and expertise locator system that could be used to find the right resources (Becerra-Fernandez, 2006). This will be further discussed in the next chapter.

Gates

The empirical findings show that gates are not always followed. They can be moved ahead in time and some deliverables can be moved to the next gate. There is also an improvement area connected to fit the different time plans for each department.

Table 5.5 Gates results validated by theory

Results	Theory
No alignment of the different time plans for each department	Time consuming, resulting in unnecessary activities. (Grönlund, et al., 2010)
Gates are not always followed	Bureaucratic procedures. (Grönlund, et al., 2010)

The first improvement area is primarily a result of lack of knowledge, for instance during the interviews the connection between PSM and DVP could not be found. An ICT-solution helps this alignment for companies to cooperate despite different organizational forms (Camarinha-Matos, Afsarmanesh, Ollus, 2008). The second area could not be supported by an ICT, bureaucratic procedures needs to be standardized to be able to be supported.

6. DISCUSSION

The discussion focuses on the improvement areas from the empirical findings and the supporting theory. The first paragraph discusses the problem defined in the problem definition and how it is affected by the improvement areas. Second paragraph mentions if an ICT-function is applicable to the improvement areas. The third paragraph states if an ICT-platform can be implemented at Volvo Group Trucks. The last paragraphs discusses how an ICT-platform could be implemented and how the general response could be expressed.

As could be seen from the analysis there are correlations between the current state and the theory. The theory consists of chapters that highlight how a general project and a product development project should be managed to successfully develop a product with high quality and in time. In the analysis several cases are shown that the improvement areas does not coincide with the standards of a well-functioning project process, as mentioned in the theory. From the problem definition it is stated that projects at Volvo Group Trucks are delayed and that they are not following the principles set when working in product development projects. The authors do not think these improvement areas are solely responsible for the delays in product development projects, and this thesis cannot answer in what extent the improvement areas affect projects because of the small research scope. However the authors can assume from the interviews that they do affect the collaboration between the chassis department at GTT and GTO when working in such projects. The theory states that ineffective collaboration makes project ends up being delayed (Vandelvelde, 2003), with this the authors can say that the improvement areas are delaying product development projects, but as said earlier the authors cannot say to what extent the improvement areas are affecting a product development project. The authors also assume that the improvement areas look similar between other GTT departments and GTO. This assumption is made on the basis from the interviews with GTO employees.

According to the analysis several areas were found where an ICT-solution could help support the project work at Volvo. (Becerra-Fernandez, 2006) also gives examples on how ICT-solutions could facilitate the improvement areas. This leads to ad-hoc solutions, which does not fully incorporate the complete project infrastructure as mentioned in the theory (Camarinha-Matos, Afsarmanesh, Ollus, 2008). An organization needs an ICT-platform that incorporates all aspects of project work.

Table 6.1 Prerequisites not fulfilled

Improvement areas	Theory
Easy access to data and regular updates	(Coakes, 2006)
Transparency	(Rabelo, 2008)
Several different software's and tools	(Camarinha-Matos, Afsarmanesh, Ollus, 2008)
Several and unstructured communication channels	(Camarinha-Matos, Afsarmanesh, Ollus, 2008)

The mentioned improvement areas in Table 6.1 are prerequisites that need to be managed in advance of implementation of a fully functional ICT-platform. The theory states that it can support some of these areas, i.e. increased collaboration will increase the transparency. The authors' thinks that the transparency with for example not knowing who to contact; is an unstructured transparency and it needs to be structured before an ICT-platform can support it. Other issues that need to be mentioned are the amount of different software tools used. By having that amount of tools it is difficult to construct a coherent ICT-platform. Also a more general issue is the different personalities among people which are both difficult to estimate and to solve. That being said, GTO and GTT incorporate the three preconditions that were stated by (Rabelo, 2008).

1. Requires collaboration among involved partners that does not only involve sending e-mail messages.
2. The existence of trust, considering that partners shall rely on each other (at all levels).
3. All (or most of) the activities carried out within a collaborative network organization should be made via computer networks, i.e. digital transactions should be the routine, and not an exception

By having the three preconditions the authors argues that it justifies that Volvo is ready to start investigating on how an ICT-platform should be implemented.

How an implementation of an ICT-platform would succeed and how it will be accepted depends on the preconditions. As had been said earlier there are a lot of tools at Volvo, this could be discussed to be several ad-hoc solutions. As stated from the interviews, some software are seldom used because of lack of knowledge of the software or that they are too complex to use. An example is the database with completed projects; the inconsistent naming convention makes it hard for people to find the projects they are looking for. This is a case of software being implemented or managed wrong. If employees could give feedback on the system before implementation the authors thinks that a more general acceptance would help the implementation of an ICT-platform.

If all these underlying issues are not taken into account when developing an ICT-platform, it will probably not work as intended even if the platform itself is working as it should.

6.1 Further work

For the first paragraphs in the discussion, it is stated that the scope of this research is only applicable to the research area. To be able to find out if the results of this thesis can be applicable to all stakeholders involved in product development projects and their respective interfaces, all departments at Volvo needs to be researched.

The prerequisites for an ICT-platform are not fully met, which means that further research needs to be conducted on how standardized project work can be managed at Volvo. Not only to give a more detailed analysis of the subject, but also to create a foundation for the architecture of the ICT-platform. It would also be interesting to see if and how the PTM system could be implemented into the final ICT-platform.

If an ICT-platform would be implemented, a research on the current technical knowledge at Volvo needs to be performed. This to find out if they have the expertise to translate the practical project work into a complete ICT-platform.

7. CONCLUSION

The conclusion addresses how and where in the thesis the research questions were answered. The purpose of this master thesis was to find out if an ICT-platform can be implemented and help project work at Volvo. The results from the discussion show that an ICT-solution can be implanted but to implement an ICT-platform further work is needed.

How is practical project work carried out at GTO and GTT?

How practical project work is carried out is answered in the empirical findings, chapter 4.2. It is evident that for product development projects a Stage-Gate model is used which is designed for product development projects. Meanwhile GTO uses a project process called PSM, which is used primarily for production changes and not product changes. At the moment the two different project models are not completely aligned.

How is information communicated between GTO and GTT in project work?

This is answered in the empirical findings chapter 4.1. Several different tools and communication channels are used when sending information, where unstructured data is often sent through e-mail and Microsoft Share Point, and structured data is sent via System E and System F. The communication, information and transparency mentioned in the problem definition were found during the interviews, which resulted in several potential improvement areas. The scope of this research limits the field of how well the different improvement areas cohere with other departments at Volvo and is suggested as further work.

How can an ICT-platform support project work and collaboration at GTO and GTT?

This is answered in chapter 5 and elaborated in chapter 6. Several ad-hoc solutions could be found to increase the collaboration between GTT and GTO. As mentioned in the discussion the ad-hoc solutions will only resolve one issue. Moreover it was stated that the company is not ready for a complete implementation of an ICT-platform, which has been suggested for further work.

ICT-solutions could be implemented but only to solve specific problems. To be able to implement an ICT-platform the prerequisites need to be solved.

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APPENDIX A

Communication				
Subject Nr.	**Interview Nr.**	**Specific Issues**	**General Issues**	**Proposed Solution**
C1.1	2	Send email to concerned PMs	Group management	Automated within ICT
C1.2	2	Communication GTT-GTO enclosed, sometimes CPM missed contacting stake holders	Group management	Improved cross functionality with direct messages to all stake holders within a group
C2.1	3	The size of the project is not determined, it can grow and switch from one line organization to another (said by GTO)	Project maturity	More information about the project to all stake holders
C2.2	3	Merging projects takes time and resources	Project management	Standardized way of grouping projects
C3.1	3	GTO-local needs info about the product, GTO PM needs info about the production	Transparency	Good communication between product designer and technical preparation
C3.2	3	GTO doesn't find the organization transparent. GTO needs to ask for information.	Transparency	Better communication, right information should flow to the right people
C3.3	3	Product development is isolated within GTT (said by GTO)	Transparency	Invite GTO to have better understanding in product development
C3.4	3	There are three communication interfaces (said by GTO), GTT-GTO PM, GTO Regional-GTO Local, GTO Regional	Transparency	Merge communication
C3.5	3	Delayed Start cost project usually result in shorter lead time for GTO. GTO works harder, may cause bad quality	Transparency	Communication or hint in time so GTO may have a chance to handle it
C3.6	3	Tools are developed and suddenly the concept is changed and the tool is outdated, this leads to high costs	Transparency	Better communication at the right time

Communication				
Subject Nr.	**Interview Nr.**	**Specific Issues**	**General Issues**	**Proposed Solution**
C4.1	4, 10	The performance of the project is based on the chemistry between people and also how older projects worked out (the "best" solution is not always the best solution)	Neutralize people chemistry	Standardized communication approaches
C3.7	4	GTO is not a part of the development loops as they want and should be	Transparency	Better cross-functionality
C4.2	4	The technical preparation team and people involved in the industrialization phase do sometimes have divided opinions	Communication and standardization	Better communication within GTO
C3.8	4	GTT only sees a fraction of the production development	Transparency	Better cross-functionality
C1.3	5	Everyone needs to be informed when a project is late	Transparency	Group communication
C4.3	5	GTO may have to deliver a concern to GTT that first was not a demand but when they got challenged it turns out into a demand (GTT: Sometimes the cost of fixing the issue is more than just leaving it as it is)	Neutralize people chemistry	Due to different personalities. Standardized communication approaches
C3.9	7	One person tries to get out information from a project on GTT due to long lead time tools	Transparency	GTO needs information early
C3.10	10	GTT can change the whole concept of a product from what we were working on.	Transparency	GTO needs fast updates so they don't work on outdated data

Documentation				
Subject Nr.	**Interview Nr.**	**Specific Issues**	**General Issues**	**Proposed Solution**
D1.1	1	Product change leads to not all IDs are updated through the chain	Inconsistency when updating data	
D1.2	1	Documents need to be updated	Old documents	Notification system for stake holders
D1.3	1, 2, 10	Same document are stored on different places, templates are hard to find	Inconsistency when storing files	Documents needs to be stored on same place, template database
D8.1	1	Quality status reporting takes time, needs to be reported to the manager	No flexible status system	Quality reporting system
D1.4	2	Hard to find documentation on how to use different tools	Inconsistency on which database to use for how-to documents	Knowledge database
D2.1	2	The structure on Microsoft Share Point looks different depending on the PM	Inconsistency in structure	Standardized structure (names and place of files and folders)
D1.5	2	Small product changes (GTT) does not lead to a new article number which may affect other departments later	No alert system through the whole stake holder chain	Visualize/educate the importance in how a decision may cause problems later. Fail proof when changing product.
D1.6	2	Few people read white books	Inconvenient to find documentation	Lessons learned log
D1.7	2	Structured work flow plan is not updated	Inconvenient to update project plan	Easier accessible and updated structured work flow (process handler)
D3.1	3	Merging projects takes time and resources	Project management	Standardized way of grouping projects
D3.2	3	Needs to contact GTO PM for information about the product project portfolio	Project management	Easy access to the portfolio
D4.1	4	It's more important to be able to visualize the project plan than what tool to use. Microsoft Project is hard to visualize.	Visualization	Visualize project plan in ICT

Documentation				
Subject Nr.	**Interview Nr.**	**Specific Issues**	**General Issues**	**Proposed Solution**
D5.1	4	GTO isn't a part of the development loops as they want and should be	Transparency	Better cross-functionality
D4.2	4	One hard aspect is to get a good picture of the whole project	Holistic view	Visualization and connect stake holders within ICT
D5.2	4	GTT only sees a fraction of the production development	Transparency	Better cross-functionality
D7.1	4	Experience is the most important input to a project, can't be replaced with systems	Experience Management	Capture relevant experience (Serena). Tag cloud where common activity names and time consumption from earlier projects are saved
D6.1	4	GTT and GTO uses different tools which leads to time consuming formatting	Tools	Common tools
D1.8	5	When starting a project CPM can set the rules for the project, i.e. what project planning tool to use or the structure in Microsoft Share Point	Rules management	The rules is included when starting a project so all PMs can see
D5.3	7	One person tries to obtain information from a project on GTT due to long lead time tools	Transparency	GTO needs information early
D6.2	7	People use tools of their own choice (i.e. project planning) due to different knowledge	Tools	Standardized way of working
D2.2	7	People doesn't always save files in a structured way on Microsoft Share Point	Standardization	Standardize structure and way of working
D2.3	7	Project info should be at Microsoft Share Point, this is not always the case	Standardization	Standardize structure and way of working

Documentation				
Subject Nr.	**Interview Nr.**	**Specific Issues**	**General Issues**	**Proposed Solution**
D8.2	8	8 intro block per year, 4 small, 4 large. Usually System A and System B, see Appendix C. The larger is PMR and Start Cost. Specific dates.	Time	Calendar or similar
D9.1	8	Measurement of project quality in terms of faults or no faults. Not accounting the money each project costs leads to no priority	Project priority	If money was included the problematic projects could have a better priority order
D8.3	8	Some intro blocks can't be delayed due to legal requirements i.e. air bag	Time	Importance system
D9.2	8	ILG – Industrial Launch Group. Local at each factory where they look through all departments and suppliers to see if all activities have been done. Work saved in an Excel sheet in Microsoft Share Point	Project assurance	The work of ILG could be facilitated in an ICT
D7.2	8	There is a designated Intro Engineer that takes care of PMR, System A and System B (see Appendix C) in their respective area, where they need to investigate how different changes impact each other	Project correlation	Correlation between changes and connect impacts
D2.4	10	Aligned gates between DVP and PSM is under construction. PSM is great for in-house projects but only use the tools for product projects	Official structure	Official structure removes the need of doing a local solution
D5.4	10	GTT can change the whole concept of a product from what we were working on.	Transparency	GTO needs fast updates so they don't work on outdated data

Documentation				
Subject Nr.	**Interview Nr.**	**Specific Issues**	**General Issues**	**Proposed Solution**
D5.5	10	In the beginning of a project it is really hard to interpret the project	Project maturity Transparency	All stake holders needs to know their part and task as soon as possible

Knowledge				
Subject Nr.	**Interview Nr.**	**Specific Issues**	**General Issues**	**Solution**
E1.1	1	”Why change a fully working GDP”	Change management	Information and education
E2.1	2, 3	Some people are not aware of high workload in the beginning of a project and changes the way of working (front end loading)	Awareness	Educate on how to execute a DVP project
E2.2	2	Not enough resources when using DVP leads to late deliveries	Awareness	Information the workload in a certain type of project leads to easier planning of resources
E4.1	3	GTT PMs has good information about GTO, designers have not	Transparency	Information/education to the right people
E3.1	3	PSM can be followed in different ways: -Experience of PM -General experience of the project group -How mature the project is	Standardization	Educate/inform how a project model should be followed
E1.2	4	RnD30 and other new improvements needs to have set goals that people understand	Change management	Educate why
E2.3	4	PGT and PAP is hard to follow	Awareness	Education of tools
E2.4	5	GTO says no to a lot of issues regarding DFA. (Impression from GTT is that they don’t understand DFA)	Awareness	Educate/inform why a certain task is important

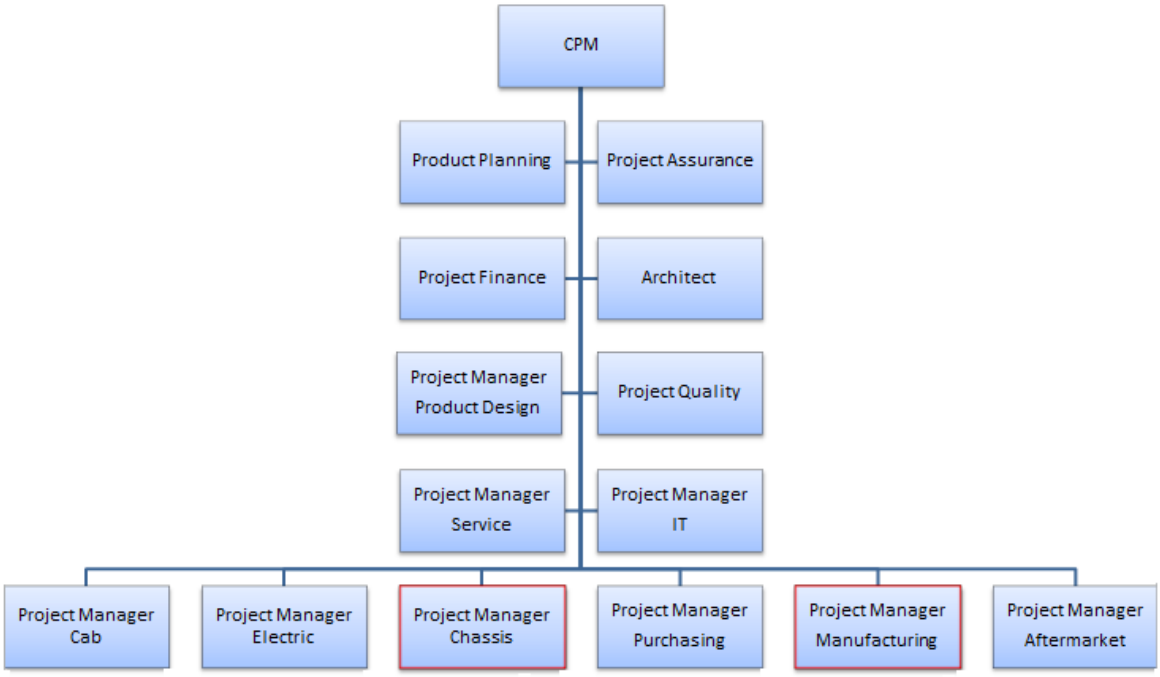
Knowledge				
Subject Nr.	**Interview Nr.**	**Specific Issues**	**General Issues**	**Solution**
E3.2	7	People use tools of their own choice (i.e. project planning) due to different knowledge	Standardization	Standardized way of working
E3.3	8	Different conditions between factories, not only technical but language and cultural as well	Standardization	Standardization that accounts for different causes
E1.3	9	The hard part is to get people to use new products and tools	Change management	Educate and show the benefits
E2.5	10	Educate people in PSM so they know what tools that are available	Awareness	Education will decrease the scattering on how a project should be executed
E3.4	10	Assembly simulations are done but can't cover all parts, designs, variations and models. GTT and GTO are not in an agreement on who should handle the assembly simulations.	Standardization	Everybody knows who should do what

Resources				
Subject Nr.	**Interview Nr.**	**Specific Issues**	**General Issues**	**Proposed Solution**
R1.1	1	Different organizations on every project	Resource problem	Visualize organization and hierarchy
R1.2	2	Not enough resources when using DVP leads to late deliveries	High workload, Resource problem	Database on the workload connected to each role
R2.1	2	Communication GTT-GTO enclosed, sometimes CPM missed contacting stakeholders	Group management	Improved cross functionality with direct messages to all stake holders within a group
R1.3	2	Takes time to search for resources	Resource problem	Resource pool, system to see how many and what projects people are part of
R1.4	2	People are being replaced	Resource problem	Resource assurance
R3.1	4	The performance of the project is based on the chemistry between people and also how older projects worked out (the “best” solution is not always the best solution)	Neutralize people chemistry	Standardized communication approaches
R1.5	4	It is important to have capable people in the project	Resource problem	Resource assurance
R4.1	4	One hard aspect is to get a good picture of the whole project	Holistic view	Visualization and connect stake holders within ICT
R4.2	5	Everyone needs to be informed when a project is late	Transparency	Group communication
R3.2	5	GTO may have to deliver a concern to GTT that first is not a demand but when they got challenged turns out into a demand (GTT: Sometimes the cost of fixing the issue is more than just leaving it as it is)	Neutralize people chemistry	Due to different personalities. Standardized communication approaches

Resources				
Subject Nr.	**Interview Nr.**	**Specific Issues**	**General Issues**	**Proposed Solution**
R2.2	8	12 technical areas where intro engineering has one person at each area. Local engineering is divided into layout and Technical Preparation into modules. Have to talk to several, not only one local engineer when the layout is changed.	Group management	ICT should have the responsibilities of each engineer divided in both modules and layout and then group the affected people
R2.3	8	It is important to be effective on meetings and that they follow an agenda and structure. GTO PM has a list on who to invite on meetings	Group management	The right people on meetings and stick to the agenda
R1.6	10	Experience and contacts has a huge impact on how fast a problem can be solved	Resource and experience management	Right people know how to solve problems
R1.7	10	Organization charts are used but not always updated, takes time to find your resource	Resource problem	ICT can be updated automatic when people leave projects or new one arrives

Gates				
Subject Nr.	**Interview Nr.**	**Specific Issues**	**General Issues**	**Solution**
G1.1	1	Late changes on product make production less adaptable	Transparency	
G1.2	1	Gates can sometimes be merged		Dynamic platform
G1.3	3	PSM gates needs to be adapted to fit into DVP gates		Is done internally at GTO right now
G1.4	4	Delays in a Start Cost project spreads		
G1.5	6	Departments have different lead times and cannot always follow time plan	Time plan	Dynamic platform

APPENDIX B



APPENDIX C

Tools and IT-Tools

There is a range of different tools available in both project work, assignments and line work, where each tool usually has one specific purpose. Below is a list of specific and general tools used in projects.

- System A - Quality issues notification system
- System B - Product modification notification system
- System C - Closed projects database
- System D - Resource management system
- System E - Production database
- System F - Product database
- System G - Tolerance tool
- PGT - Project governance system
- Microsoft Share Point
- Lync
- Intranet
- Microsoft Project
- Excel

APPENDIX D

Introduction of ourselves

Explaining why we are conducting this interview.

Can we record this interview?

Questions of introduction

Would you like to tell us about your education and career?

What role do you have in the organization?

Can you tell us briefly about what you are working on and what kind of projects?

The organization of the project

What roles are there, what is the interaction are their between the different roles?

Main Questions

Type of project

Do you follow any project model?

How easy is the PSM/DVP followed?

How do you find this project model? (Does it fulfill its purpose?)

If you follow the PSM differently depending on the project?

What tools do you use to create and manage projects?

Manual and IT tools

How do you delegate tasks and how do you follow up?

What tools do you use to control the project?

Is there documentation on how to work with these tools?

We have heard that the startup cost project will be delayed, how are you affected by it?

What do you think is the reason?

Internal Data Management & Communication

How do you process value adding data? (Recycled / stored data)

What internal communication tools do you use?

External Data Management & Communication

How does the data being exchanged between the other departments? How to check that the data has been received?

How do you share with you of your output from a value creation process to other departments?

What communication has taken place before data is exchanged?

Collaboration GTO-GTT

In which phase of the project will the collaboration the with the GTT/GTO increase?

Is it in any particular phase of the project which is working?

If there is a change of a product how do you notice it and vice versa?

Are there limitations or directives on how data is supposed to be communicated between departments?

Do you perceive the organization as transparent?

Suppliers

Do you communicate with suppliers? How is the communication?

How are the data between you and supplier? Are there limitations or directives for the flow of information?

How are things generally going when working in projects?

Does project work well?

What are the strengths / weaknesses?

Some special things that you think are missing?

Concluding questions

What do you have and what do they expect in the future?

If there was a tool that could facilitate projects, would it be used, or does it feel like one in the crowd? What would be needed for PM and other users to feel it is a necessity in their daily work?