

**UNIVERSITY OF VAASA
FACULTY OF TECHNOLOGY
INDUSTRIAL MANAGEMENT**

Toni Warvas

**STANDARDIZING THE GLOBAL ORDER-TO-DELIVERY PROCESS IN A
PRODUCT GROUP: A CASE STUDY IN A GLOBAL MANUFACTURING
COMPANY**

Master's Thesis in
Industrial Management

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ABBREVIATIONS

ATO	Assemble-to-Order
BOM	Bill of Material
BU	Business Unit
CNMOT	Production unit in China
CS	Central Stock
CSA	Central Stock in Asia (Singapore)
CSCNM	Central Stock in China
CSE	Central Stock in Europe (Germany)
CSN	Central Stock in North (Sweden)
CSS	Central Stock in South (Spain)
EI	Enterprise Integration
ERP	Enterprise Resource Planning
ETO	Engineer-to-Order
FIMOT	Production Unit in Finland
FP	Freezing Point
GLOFO	Global Footprint
HR	Human Resources

IEC	International Electrotechnical Commission
INMOT	Production Unit in India
IS	Information System
KM	Knowledge Management
KPI	Key Performance Indicator
LPG	Local Product Group
MTO	Manufacture-to-Order
MTS	Make-to-Stock
NPS	Net Promoter Score
NWC	Net Working Capital
OECD	Organization for Economic Cooperation and Development
OMS	Order Management System
OPEX	Operational Excellence
OTD	On Time Delivery
PG	Product Group
PLMOT	Production Unit in Poland
PU	Production Unit
ROP	Reorder Point

SD	Standard Deviation
SEMOT	Production Unit in Sweden
SOD	Stock on Demand
SU	Sales Unit

UNIVERSITY OF VAASA**Faculty of technology**

Author:	Toni Warvas
Topic of the Master's Thesis:	Standardizing the Global Order-to-Delivery Process in a Product Group: a Case Study in a Global Manufacturing Company
Instructor:	Jussi Kantola
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ABSTRACT:

This research project was initiated by a product group operations manager of a global manufacturing company to bring transparency and harmonization in the global operations. There are 11 units in the product group, and in the past the units were managed locally. Two years ago the company introduced a new structure where the product group is globally managed and the units are only responsible for producing the end products. Some of the local processes have been transformed to global processes already, but the company is still facing a great deal of problems due to different procedures between the units. This research project aims to induce harmonization in the global operations through process documentation, standardization, and defining the commonly used strategies and models. The distribution of created materials was performed by establishing a web-based portal called handbook that included everything created during this project. At the end of the project the created standard procedures were compared to the current means to operate using a gap analysis.

The research framework was created based on the information acquired from the existing research literature in relevant fields of studies. The empirical data for the research was acquired through discussion and e-mail conversations with the process masters in each function in each unit. Part of the empirical data was found through different internal databases. Three product group managers were also actively involved with this project and communicated a lot of empirical information and knowledge to the researcher regarding the global processes.

The acquired results indicated that the case company could standardize its global operations through the created standard process models for the selected processes with relatively low perceived risks involved. On the other hand, harmonizing efforts might require plenty of resources, and the implementation might not be possible in the near future because of it. The created gap analysis provided a comprehensive general picture of the global situation to support future management decisions.

KEYWORDS: Harmonization, standardization, documentation, knowledge management

VAASAN YLIOPISTO**Teknillinen tiedekunta****Tekijä:**

Toni Warvas

Tutkielman nimi:

Globaalin tilaus-toimitusketjun
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TIIVISTELMÄ:

Globaalin yrityksen tuoteryhmän operaatiopäällikkö aloitti tämän tutkimusprojektin tuomaan läpinäkyvyyttä ja yhdenmukaisuutta globaaleihin toimintoihin. Tuoteryhmään kuuluu tällä hetkellä 11 yksikköä, jotka olivat aikaisemmin paikallisesti johdettuja. Kaksi vuotta sitten yritys esitteli uuden yritysraakenteen, jossa tuoteryhmiä johdetaan globaalisti, ja kaikki yksiköt ovat vastuussa vain lopputuotteiden valmistamisesta. Muutamia paikallisia prosesseja on muutettu jo globaaleiksi, mutta yritys kärsii silti ongelmista, jotka johtuvat eri yksiköiden erilaisista toimintatavoista. Tämän tutkimusprojektin tavoitteena on saada aikaan yhtenäisiä globaaleja prosesseja luomalla prosessikuvauksia, standardoimalla, ja määrittelemällä yleisesti käytettyjä toimintamalleja ja strategioita. Luotujen materiaalien jakelu hoidettiin luomalla internet-pohjainen portaali nimeltään Handbook, joka sisältää kaikki tämän projektin aikana luodut materiaalit. Projektin lopussa luotuja standardi prosessimalleja verrattiin nykyisiin toimintatapoihin tekemällä kuiluanalyysi.

Tutkimuksen viitekehys luotiin merkittäväksi katsottujen alojen tutkimuskirjallisuuden pohjalta. Tutkimuksen empiirinen tieto saatiin keskustelemalla prosessien omistajien kanssa jokaisesta yksiköstä, ja heidän kanssa käytyjen sähköpostikeskusteluiden pohjalta. Osa empiirisestä tiedosta löytyi yrityksen sisäisistä tietojärjestelmistä. Projektissa oli aktiivisesti mukana kolme tuoteryhmän päällikköä, jotka kommunikoivat tutkijalle paljon empiiristä tietoa liittyen globaaleihin prosesseihin.

Tutkimuksessa saadut tulokset osoittivat, että kohdeyritys pystyy standardoimaan maailmanlaajuisia prosessejaan käyttämällä projektissa luotuja globaaleja standardi prosessimalleja, ja toteutukseen liittyy vain kohtalaisen pieni havaittu riski. Toisaalta, yhtenäistämisyrittäykset voivat vaatia paljon resursseja, ja tämän takia toteutus ei välttämättä ole mahdollista lähitulevaisuudessa. Projektissa tehty kuiluanalyysi antoi yritykselle kattavan yleiskuvan globaalista nykytilanteesta ja voi auttaa tulevaisuuden liikkeenjohdon päätöksissä.

AVAINSANAT: Harmonisointi, standardointi, dokumentointi, tietotaidon johtaminen

1. INTRODUCTION

Companies nowadays are experiencing fierce competition in the increasingly competitive global markets. Strategies that have worked before may not fare well today and the companies are facing inevitable change. Multinational companies from emerging and developing economies have become competitive players in the global economy, and the younger firms seem to be entering the international markets in an earlier stage of their organizational development than before. This allows them to grow faster than the companies before. (Goldstein 2009: 137.) Finding the ways to stay ahead of the competition is important in the markets today, and companies are forced to improve their processes even further.

1.1 Background

Uncertainty in the global economy has caused problems for the companies especially in the European Union during the euro crisis. This is reflected on the companies as decline or stagnant state of growth. Tough competition along with uncertain markets poses a new challenge for companies, and it is crucial to stay ahead of the competition. Organization for Economic Cooperation and Development (OECD) maintains a database for statistics regarding the member countries. As the case company of this study is a manufacturing company, total industrial production rate statistics was chosen to represent the current market situation. Currently there are 34 members in OECD. Figure 1 demonstrates the situation well as USA is the only country in this figure being able to increase its industrial production rate during this time. Another interesting observation from the Figure 1 is that US, EU, and Japan are well below the OECD total average. This means that there are many countries being able to increase their production significantly.

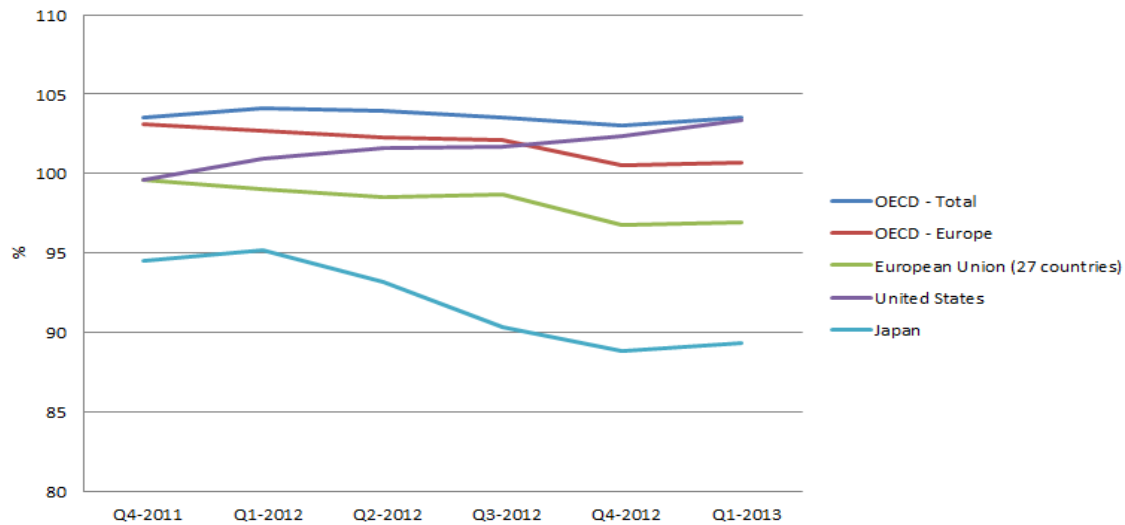


Figure 1. Total industrial production in different economies. Baseline for total production is year 2005 (100 %). (OECD 2013.)

The case company of this study is a global manufacturing company with around 145 000 employees in approximately 100 countries. Currently there are six production units, five central stocks and over a hundred sales units within the product group. The company is divided into functional divisions, these divisions consist of business units (BU) and the business units are further divided into product groups (PG). In this study we focus on one of these product groups that has around 3800 employees and is specialized in low-voltage electric motors. The case company has undergone major structural changes within the last few years. The operations used to be factory centric meaning that each production unit (PU) controlled all the function needed to run the operations independently. The production units were even competing with each other in some cases. With the recently introduced product group level the production units share global functions and aim for common goals. The PG level function managers are harmonizing the operations, and the production units have a standard way of reporting the key performance indicators (KPIs) to the PG. The production unit's focus is shifted from the managing the whole value chain into managing the order-to-delivery process.

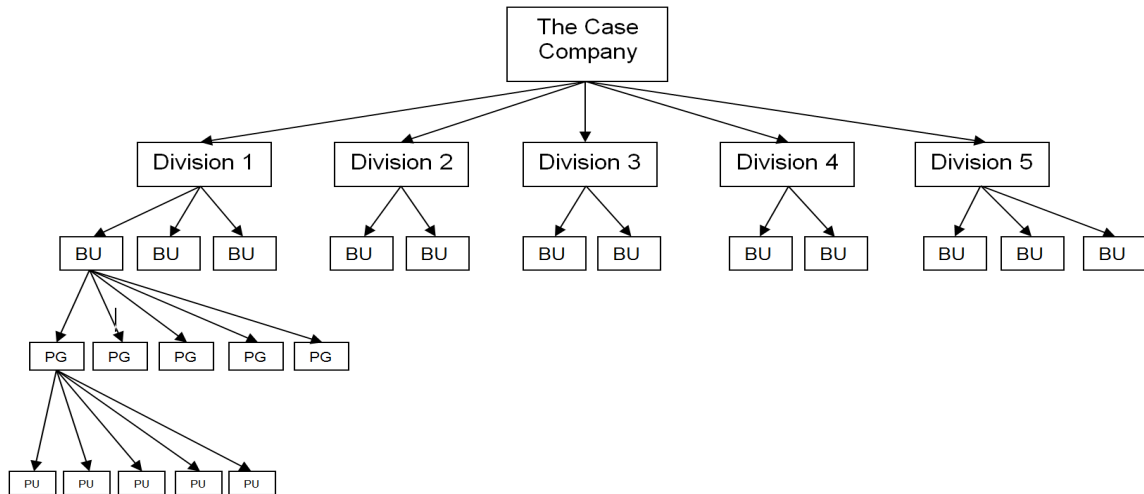


Figure 2. The case company structure illustrated.

Results of implementing the current PG level have been excellent but there is room for much improvement. The PG level information and knowledge is currently scattered in various databases. There is a good deal of information only within the employees of the company that is not transparent for anyone outside the function or process. There are a lot of different procedures within the units as there are some processes that lack PG level standard operating procedures. This project was initiated by the PG operations manager to standardize the PG operations, document the current situation, and to create an information system (IS) portal. In this IS the PG level information and knowledge can be stored, and to induce harmonization in the long run. Standardization is claimed to damage innovation, but it provides more consistent operations, increases process efficiency and makes process control easier (Kondo 2000: 8).

The purpose of this study is to drive standardization and harmonization in the PG level order-to-delivery process through process documentation, standardization, and a common information system (IS). In addition the definitions and strategies are documented and explained to avoid mistakes due to misinterpretations. These targets are achieved by implementing a global information system called the handbook of order-to-delivery processes for PG level. The handbook platform includes general information and knowledge regarding the PG and, definitions for terminology and different strategies, documented current processes, and standard operating procedures for selected processes. Standardizing these operations and having the common handbook platform contributes to uniform operations, increased efficiency, increased

PG knowledge, and to increased transparency of the operations. Rise in transparency contributes to uniform reporting, ease of pinpointing the problems and assists with the decision-making. Jahansoozi (2006: 943) suggests that when there is a lack of trust between the stakeholders, transparency can help rebuilding trust and commitment in the relationship. In this sense transparency can promote trust between the Production units (PU) and the PG management. When the operations are transparent, internal and external stakeholders are able to see where the responsibility lies (Jahansoozi 2006: 943). According to the case company's operational excellence and manufacturing managers there are situations, where the responsibilities are hard to define or they are just not known. Clearly defined processes can mitigate these problems and save a lot of time. The handbook is targeted primarily on internal use but a limited view of the processes is available for external stakeholders.

1.2 Research question

The material created for this study is inputted in a database with all the necessary data regarding the PG operations. The scope, structure, and content of the platform were for the author of this study to decide but the supervisors of the project were giving constant feedback from the progress. The database platform was chosen to be Microsoft Sharepoint based, as the company is moving towards using Microsoft based products in general and most of the users are familiar with the Sharepoint environment. The research question of this study is: **How can the case company standardize the PG operations?** The research question is further divided in sub questions:

1. What are the standardized aspects of the project?
2. What kind of problems is the company facing when harmonizing units with different operational strategies?
3. What are the expected results from each standardization aspect?
4. What can be learned from the literature regarding the topic, and what can the company learn from this project?

1.3 Structure

The structure of this research is divided in three major steps: creating the model to carry out the project based on the information learned from the research literature, presenting the general model created in this study, and analysing the effects of implementing the created standard models using gap analysis, where the current means to operate are compared to the created global guidelines. Chapter two of this research is the literature review, where relevant fields of studies are selected and the relevance for this research is explained. Chapter three introduces the case company in general and the PG. The general project and the implementation models are also explained in detail in this chapter. Chapter four presents the empirical part of this research and it consists of presenting the standard guidelines created for four of the selected processes, the general information about the global operations and strategies that are part of the database. The gap analysis is also included in Chapter four where the feasibility and risk of closing the identified gaps is evaluated. In Chapter five the utilization of the handbook platform is discussed, and the links to the existing literature are analyzed. The limitations of this study are also analyzed in Chapter five and recommendations for further research are given. Chapter six contains conclusion where the research project is summarized and acquired results are reflected on the appointed targets.

1.4 Literature

There are no similar cases in the existing research literature with the case in this study, therefore a combination of different fields of studies is used to carry out this research. These fields of studies used to create the framework for this research are: process standardization, process documentation, integration of global operations, knowledge management, transparency in operations, and information systems. Standardization is a common topic in the research field and plenty of material is available. The effects of process standardization have been studied in the recruitment process (Münstermann, Von Stetten, Eckhardt & Weizel 2010), purchasing process (Sánchez-Rodríguez, Hemsworth, Martínez-Lorente & Clavel 2006), and the relationship between IT intensity and standardization (Beimborn, Joachim, Gleisner & Hackethal 2009). The aspect of losing innovation when standardizing operations is analysed by Kondo (2000). Part of the standardization is the implementation of the best practices into process standards. Jarrar & Zairi (2000) have studied the transfer of best practices within the

company and identified different barriers for implementations. An overall study of factors influencing the process standardization was conducted by Schäfermeyer, Grgecic & Rosenkranz (2010).

Process documentation is a major part of this project as the target is to document selected processes and create global process guidelines (or standards) for them. Urgan (2006a; 2006b) has studied the process documentation in general, and the process of achieving standardization through process documentation. Rosemann (2006) has identified common pitfalls when modelling processes. Recognizing these pitfalls increases the chances of success with the process documentation and modelling. Literature regarding integrating global operations and knowledge management helps identifying the potential problems encountered during this project and to help defining the methods used. Different frameworks have been introduced on global integration of operations (Braganza 2002; Lubowe, Cipollari & Antoine 2009). Transparency is an important output of this project, and the effects of process mapping on transparency have been researched by Klotz, Horman, Bi & Bechtel (2008).

Knowledge management (KM) is important part of today's business and it plays a major role in this research since the idea behind the main objectives is to increase the process knowledge within the case company. Understanding the meaning of knowledge and the practises used to manage it, can greatly improve the Sharepoint portal created in this study. Goh & Hooper (2009) have made a case study of knowledge management in a closed environment. Broad literature overview of knowledge management was conducted by Mårtensson (2000), while general research on KM (Armistead 1999; Call 2005).

As one of the objectives of this study is to create a common database for common processes and information, the understanding of information systems is crucial. Case studies for implementing information systems can be found on manufacturing (Zhuang & Burns 1994), quality assurance (Nookabadi & Middle 2006) and executive information (Salmeron, Luna & Martinez 2001). Akmanligil & Palvia (2004) analysed different strategies for implementing a global information systems. The management issues are addressed by Kumar & Palvia (2001), when implementing a global executive information system.

1.5 Empirical data

The acquisition of empiric data for this research is divided in three different phases. The first phase was the gathering of data regarding the case company, product group, and the current operations. This information was available from the company's internal databases, while deeper understanding of the processes was achieved by having informal interviews with the employees of each function. The second phase is the empirical data collecting for deeper and detailed understanding of the processes through discussions with the process masters and studying the documents provided by the process masters. The data gathered in this phase contribute directly to the content of the handbook platform. Analyzing, processing and implementing the acquired data is the third phase. Empirical data consists of the observations made by the author and from the implementation process. When necessary data was gathered, the researcher was able to document the current procedures and formulate the standard models for each selected process. After the processes are documented and the standard models are created, the gap analysis can be performed.

The content for this project was defined in general in the beginning of the project, but the scope was narrowed down during the project to include primarily order-to-delivery processes and processes closely related to it. The PG operations manager, operational excellence manager, and manufacturing manager were assisting with this project on daily basis, and they provided valuable insight during the entire project. The gap analysis is performed with these three managers as they have excellent general picture of the current situation within the PG, and having a lot of experience of the global operations and process management.

1.6 Method

This is a case study research of implementing standardization and harmonization on the case company in the form of uniform global information system. Case study research is suitable for increasing knowledge of some specific event without providing generalizable knowledge (Saaranen-Kauppinen & Puusniekka 2006). By nature this is qualitative research. Inductive deduction is characteristic for qualitative research that aims to make generalizations and conclusions based on the facts found in the research materials (Eskola & Suonranta 2008). Generally the primary methods for collecting

qualitative data are individual interviews, focus groups, observations and action research (University of Surrey 2013). In this study every method mentioned is used except for the focus groups. The literature regarding the subject is primarily used to assist with the implementation process, and the formulation of the project framework.

Implementing project of this degree requires tremendous efforts and knowledge of how to follow through the project. Because of the unique nature of the case study there is little information available of similar cases in the existing literature. Most of the existing literature regarding standardization is about standardizing manual labor, while on this study the focus is on standardizing global operations and information and knowledge sharing. The existing standardization literature can still provide valuable insight for this study. Other relevant fields of studies are knowledge management, process documentation, transparency in the operations, information systems, and global integration of operations. These aspects assist with the implementation of the software platform, where the documented and standardized processes are stored along with other information that is seen necessary for this information system.

The acquisition of empirical data is divided in three phases. The rest of the project follows this three-stage model as well. In the first phase it was vital for the author to get comprehensive view of the case company. This was achieved by studying the materials in internal databases and informal interviews and discussions with the employees. The company has extensive amount of general information documented in various databases mostly in the intranet, Microsoft Sharepoint portals, and in databases in Lotus Notes. As the author is working in one of the production units, it was logical to familiarize with the overall process in this particular PU in the beginning of the project, and broaden the understanding of the processes in other PUs. Fortunately for this research, there were many global PG managers and employees located within the same premises as the researcher of this project. Arranging meetings with them was easier than having phone meetings with people around the world.

The objective in the second phase of the empirical data gathering was to gain deeper knowledge of the global operations to form the basis for the handbook content. The topics selected for the handbook were discussed and decided with the project team, while the specific content for the selected topics were decided with the help of the process owners. When the selected topics were decided, the respective global PG function managers were contacted for detailed information and for additional sources of

information about the subject at hand. The current situation within the case company was mapped during the contacts with the process masters. This information was also used to create the standard processes in the next phase. The aim of the discussions and interviews was to achieve deep understanding of the processes and identify the interrelationships between different variables affecting them. Additional documents regarding the whole process were requested from the interviewees to assist with the project, as there is much information and documents outside the formal databases. Initial planning of the software platform was performed during this phase with cooperation of the marketing communication department of the PG.

Analyzing and processing of the acquired empiric data was performed in the third phase of the research, and establishing of the platform is commenced with the help of knowledge acquired through literature review of the subject. The standardization, implementation processes of the handbook, and the gap analysis are primarily the empiric data attained from this phase and ultimately the greatest contributions of this research. Process documentation and process standardization into guidelines are performed on based on the interviews, materials attained in the process, and process master's comments. Rest of the content is inputting the existing data into the database in a common format and in the requested scale. The gap analysis includes description of the current situation, description of the standard scenario, and analysis how they differ and what would the effects be from closing the perceived gap. The gap analysis also includes numeric evaluation from the three PG managers working with this project for feasibility and risk of closing the gap. The idea behind this project is to have the relevant information, knowledge, and standard operating procedures in one place and communicate the harmonization through it. The standardization aspect of this project features the standardized terminology, definitions, and explaining the different models and strategies understandably.

2. LITERATURE REVIEW

Implementing handbook of a global magnitude requires knowledge of different fields of studies. The six identified fields are standardization of processes, process documentation, global operations integration, knowledge management, transparency in operations, and information systems. These aspects cover the knowledge required to carry out the project successfully. Process documentation and standardization contribute greatly to the content of the platform, while transparency is the expected outcome. Knowledge management provides understanding of the management aspects of the system, as the database is means to increase knowledge within the PG. The literature regarding global integration of operations provides an understanding of different means to apply integration and the effect, which it has on companies. Harmonization and standardization are few of the targets of this study, and they are closely related to global integration. The database itself is implemented in an electronic database and knowledge of information systems is required. Different implementation methods and the effects of using them can be learned from the literature.

2.1 Standardization of processes

The standardization aspect in this study concerns the standardization achieved through process documentation and created global guidelines for the processes. In addition, the common terminology is defined to minimize the possibility of misinterpretations. Standardization may refer to slightly different matters and to understand the meaning thoroughly the definitions of the word should be inspected. Cambridge Dictionaries Online defines standardization as *“the process of making things of the same type have the same basic features”*. BusinessDictionary.com defines standardizations as *“Formulation, publication, and implementation of guidelines, rules, and specifications for common and repeated use, aimed at achieving optimum degree of order or uniformity in a given context, discipline, or field”*. International Organization for Standardization (ISO) defines standardization as *“A document that provides requirements, specifications, guidelines or characteristics that can be used consistently to ensure that materials, products, processes and services are fit for their purpose”*. The different definitions have the same message behind them but with different emphases. Standard may refer to industrial wide definitions of some certain process or requirements of an item such as the ISO standards. When the process or item delivers

these pre-set requirements (set by standardization organizations), they may purchase the documents that prove they fulfil the standard. These standards are extremely common nowadays and the customers often require the supplier to meet these global standards to ensure the quality of the end products or services. This research is more concerned about the internal standards set by the company for itself that define how certain operation should be performed, and more precisely global procedures in this case. In general the standard procedures have the following features (Imai 1997: 54–57):

- They represent the best, easiest, and safest way to do an activity.
- They provide a method for managing knowledge through the preservation of “know how” and expertise.
- They can be used as a reference to evaluate performance.
- They provide the knowledge of interrelationships within the process.
- They provide a basis for both maintenance and improvement activities.
- They provide a basis for training, auditing, and diagnosis.
- They provide the means to prevent recurrence of errors and minimizing variability.

The existing literature provides evidence of various benefits attained by standardizing the business processes or procedures. Münstermann et al. (2010: 934) suggest that standardization of processes improves time used in process, reduces costs, and increases quality. Beimborn et al. (2009: 1) claim that standardization of processes increases efficiency, time, quality, and controllability. Schäfermeyer et al. (2010: 1) on the other hand discovered that process standardization reduces costs, improves collaboration between stakeholders, and eases the decision-making. Similar attributes can be seen in in other related research papers as well.

The importance of standardization on the business performance is undisputable, but the effects of standardizing global strategic operations are relatively unknown. Literature regarding single functions standardization is however available. Sánchez-Rodríguez et al. (2006) studied the effects of standardizing purchasing procedures on the business performance. The results indicated that the purchasing and business performance is significantly increased by the standardization of purchasing procedures. The indirect positive effect of standardizing only purchasing procedures on the overall business process performance was significant, despite the large number of factors affecting it. Münstermann et al. (2010) studied the process standardization and how it generates

business value on a case study concerning human resources (HR) function. The results indicate that the process time was reduced from 92 to 69 days and the overall recruiting costs were about 30 % lower. The quality of applicant data and the transparency of the recruiting process were increased.

Standardization has often been criticized by having a negative impact on the innovation aspect of the company (Kondo 2000: 8). Standardization might sometimes lead into situations, where the employees are forced to perform their tasks strictly according to the standards without knowing the aim of the assigned work. Responsibility towards work cannot be built by treating the employees as substitutes for machines, while it is also to be noted that it is highly unlikely that a single standard could be the most efficient for everyone, no matter how carefully they are planned. Therefore, it is important to leave room for innovative creativity in the process to improve human motivation and create possibility to perform the tasks in a way best suited for one within the created guidelines. The internal standard procedures should act as a guideline to induce invocation, creativity and improvement instead of forcing everyone to perform the tasks in an identical manner. (Kondo 2000: 6–9.)

The standardization process reveals best practices within the company, and they can be implemented through the defined standards (Beimborn et al. 2009: 2). Best practice is defined as “*A Method or technique that has consistently shown results superior to those achieved with other means, and that is used as a benchmark*” by Business Dictionary (2013). As one of the goals of this study is to document and create global guidelines and standard operating procedures for certain processes, identifying the best practices is crucial. The knowledge of the processes is often tacit and documenting this is hard (Reddy & McCarthy 2006: 595). The challenge is making the best practices explicit and communicating the chosen methods for the end-users (Reddy et al. 2006: 595). Reddy et al. (2006: 595) identified benefits attained from implementing best practices:

- Identify and replace poor practices.
- Raise the performance of poor performers closer to that of the best.
- Avoid reinventing the wheel.
- Minimize re-work caused by use of poor methods.
- Save costs through better productivity and efficiency.
- Improve the service.

Implementing the best practices into global guidelines and standards, and communicating them through the handbook platform should induce standardization and harmonization within the case company. The success depends on overcoming the inhibitors or barriers affecting the implementation. Jarrar et al. (2000: 241) identified inhibitors and barriers for best practices:

- Top management's failure to signal their importance.
- Little shared understanding of the best practices.
- A non-standardized best practice process.
- Organization structures that promote "silo thinking".
- A culture, which values personal expertise and knowledge creation over sharing.
- Lack of contact and information exchange.
- Over-reliance on transmitting explicit rather than tacit information.
- Lack of time.
- Employees and managers not being accustomed to seek or share knowledge.
- People not being fully aware of the knowledge they hold.

These barriers should be taken into account when implementing the global guidelines and standards to ensure the success of the project. In addition, the company has to create a structure that enables the implementation of the identified best practices into practice easily (Jarrar et al. 2000: 241). The challenge of this project is identifying the best practices since the current operations have not been documented well (if at all), and the knowledge is often tacit within the employees working for the respective processes.

2.2 Process documentation

The processes documentation often refers to graphical presentation of the processes in question, in other words process mapping. For this study, additional information is documented regarding each process providing for a wide range of end-users the information they require. There is surprisingly little information available about process documentation in the current research literature. As one of the targets of this study is to implement standardization through documented processes, literature regarding process documentation is considered important. Process documentation is very closely connected with standardization but for the purpose of this study it is discussed separately to highlight the need to understand process documentation as a separate

subject. The documentation project required the project owner to acquire the knowledge of the process master in order to succeed in the project. Understanding the different forms of knowledge contributed greatly in the success of the project documentation. There were various divisions of knowledge in the literature. Nonaka, Toyama & Konno (2000: 7) divided knowledge into two types: explicit knowledge and tacit knowledge. Explicit knowledge is a form of knowledge that can be expressed formally, shared in the form of data and transmitted and stored easily. Tacit knowledge on the other hand is personal and hard to formalize. This includes subjective insights, intuitions and hunches as well. (Nonaka et al. 2000: 7.) Another division for knowledge was performed by Kogut and Zander (1992: 383): know-how and information. Kogut et al. (1992: 386–387) defines know-how as deep understanding of the operations within the company, while information is defined more as a list of ingredients. Ungan (2006a: 403) demonstrates this as making a pizza. Ingredients for making a pizza represent information while recipe represents the know-how.

Ungan (2006a: 402) proposes that organizations seek to document their processes for the purpose of improvement, standardization, reengineering, and description. Boykin & Martz (2004: 46) concluded based on previous research that the importance of understanding business processes is linked closely to organizational success. Standard operating procedures can be created through process documentation and they provide consistency in operations, reduces conflicts between current employees, and assists with the training new employees. Process documents also enlighten the interrelationships between the related components. (Ungan 2006a: 402.) Process documents are great tools for detecting problems within the process as well (Ungan 2006b: 139). In short the process documentation provides for the users a general picture of the process in an easily understandable form and a good starting point for process improvements.

There is evidence that understanding the processes in both higher management and within production is the key to process improvement since processes cannot be improved unless they are understood. If the knowledge of the process is highly tacit, it indicates that the process is not well understood. (Teece, Pisano & Shuen 1997: 105–106.) Documenting and standardizing the processes is much determined by the nature of the knowledge while the nature of the knowledge refers to the documentability of the topic. Documentability is especially problematic with know-how or tacit knowledge. (Ungan 2006b: 137.) While tacit knowledge set certain limitations for the documentation and standardization of the processes, it can also be seen as a possibility

to transform tacit knowledge into explicit knowledge and provide a good foundation for improvements.

The process documentation procedure should follow a pre-determined plan to ensure the consistency of the results. Ungan (2006a: 403-404) proposed a model for this and it is implemented in this study as well. The steps for this procedure can be seen from Figure 3.

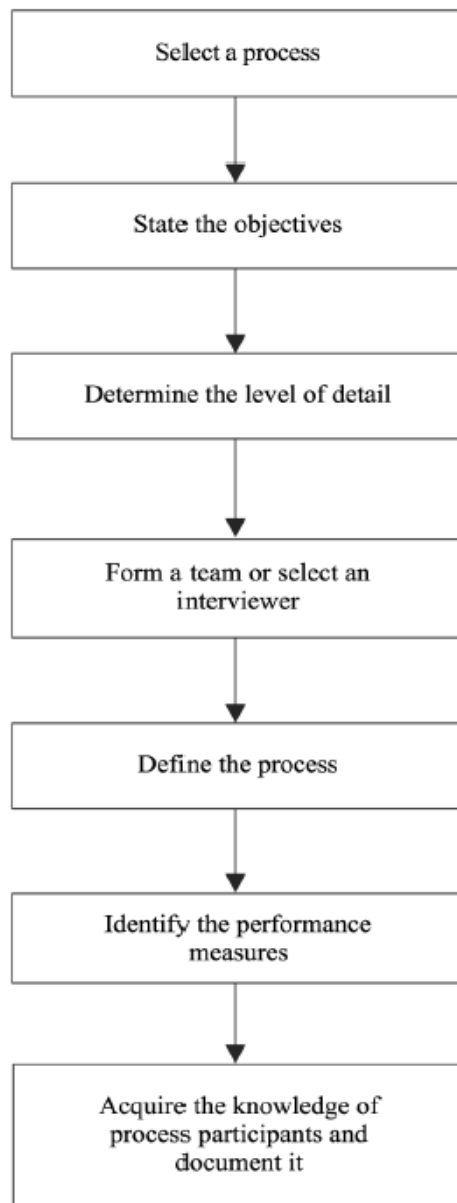


Figure 3. Step-by-step procedure for process documentation (Ungan 2006a: 404).

The documentation procedure begins by selecting the documented process and stating the objectives. The objectives should be communicated clearly, which indicate whether it aims for improving, standardizing, reengineering, or just describing a process. Third step is to determine the level of detail required from the documentation. The issue is to create the process map so that it can easily be comprehended but, include the sufficient detail. For standardization purposes the process map should be very detailed to be able to show every detail of the process. For describing purposes the level of detail should be decided by the user needs. The fourth step is to form a team and select an interviewer to carry out the data gathering. Interviewing is best suited for simpler tasks as against team is better suited for more complicated processes. Using a team is more effective than interviewing, because the process master might have difficulties describing the process, and the team members can help the process master to articulate his or her knowledge better. Fifth step is to define the process based on the data gathered in the previous step. It should be clearly defined what is the purpose of the process at hand, and include the following values: inputs, outputs, customers and suppliers. Identifying the boundaries is performed in this step as well. Sixth step is to identify the measures used in the process. The measures can be divided in two sets of measures. The first set contains measures for effectiveness, efficiency, and adaptability, while the other set includes cycle time, cost and quality. The last step is to gather the collected information and formulate the process map. In this step the interviewer or the team should walk down the process and take notes throughout the process. This is a great opportunity to gather tacit knowledge, while communication plays a major role in gathering tacit knowledge. Once the process master and the interviewer or team has reached consensus about the process, it can be mapped. (Ungan 2006a: 404–408.)

The data gathering for documentation in this study is performed by conducting interviews with the relevant personnel, because of the nature of this research (master's thesis). The results are verified by a number of people before the final documentation to give a realistic representation of the current process. The processes mapped in this study are global processes and contain steps and function from all around the world. These process steps might vary between each unit even if they are working under the similar production strategies. Therefore the author of this study is greatly dependent on few contact persons from each unit. The greatest challenge of this project is to acquire the process data from a number of various sources and identify the most important variables in the process. The success of standardization greatly depends on the communication to

users, and it requires eliminating the possibility of interpretation differences (Ungan 2006b: 144).

Being aware of the challenges is the key to success rather than blindly following the recommendations of the achieved benefits (Rosemann 2006: 249). Rosemann (2006: 249–254) identified six major pitfalls, when modeling processes:

- Lack of strategic connections: The process modeling should have a connection to one or more critical business issues.
- Lack of governance: Accurate definitions of process modeling governance should be defined.
- Lack of synergies: There are circumstances where company's different organization groups model the same process independent from each other for different purposes. This is not efficient and the reuse of the models is not fully utilized.
- Lack of qualified modelers: The modeler requires the skills to transform comments and process documentation into structured and overall process models.
- Lack of qualified business representatives: Expert modeler is not enough if the process masters cannot communicate the process well enough. Ideally there is a mix of different types of business representatives to ensure the project success.
- Lack of user buy-in: It is important to remember that business modeling is collaboration between the modeler and business representatives. In cases where the process models are available for a number of employees the models have to be self-explanatory.

To successfully perform the process documentation in this project, the background information and knowledge of the literature is studied, the proposed step-by-step process for documentation is used, and the potential pitfalls for the process documentation are identified. Knowledge management section of the literature review of this research is complementing with this section of the research.

2.3 Global integration of operations

Integration of the global operations is an expected output of this research project along with standardization and harmonization. There are various methods in achieving integration, and the literature allows increasing the knowledge on the subject. Placing global policies, procedures and standards are ordinary means to integrate the company's operations. When integrating global operations the companies are facing problems with attracting the commitment from the users, developing the necessary documentation, and selecting which data is to be documented (Moule et al. 1995: 7). Often it is not enough for the solution to be correct, but it also needs to be accepted and believed by the users to be implemented in full extent (Moule & Giavara 1995: 7). Kock, McQueen & Corner (1997: 78) noticed that data exchange inside the company can be divided into two components: information and knowledge, and they perceived that the information data flow is significantly higher than the knowledge flow. It was also pointed out that most of the literature concerns only information flows. Enhancing the timeliness, accessibility, granularity and transparency of the information flows is the key to business process integration (Berente, Vandenbosch & Aubert 2009: 120). The content of the database in this study consists mainly of information, but knowledge is implemented in the form of global guidelines indicating how the process should be performed worldwide. It can be concluded that the importance of information flows between the organizational components is important, but the implementation process is as critical since the availability of information is trivial if the users ignore using it.

Organizational integration is defined by Barki & Pinsonneault (2005: 165) as the extent to which distinct and interdependent organizational components constitute a unified whole. The integration can be performed in inter-organizational and/or within the company (Barki et al. 2005; Lubowe et al. 2009), and it can be further divided in three different types of integration: data integration, application integration, and system integration (Berente et al. 2009: 123). Data integration includes the common definitions and centralizing the knowledge on a database to reduce storing the same data on multiple locations (Schwinn & Schelp 2005: 471–472). Application integration brings together intra-organizational applications together with inter-organizational application increasing the efficiency of the overall operations (Themistocleous & Irani 2002: 155). System integration is connecting different systems together on infrastructural level and is considered a precondition for data integration (Berente et al. 2009: 123). The case

company of this study has done significant work on each of the integration aspects already and the aim of this study is to unify data integration even further.

Lubowe et al. (2009: 22) proposed a framework for operationalizing global integration. They recognized three elements that must be addressed simultaneously in order to successfully drive global integration. This is the only available framework for the topic and therefore it is presented thoroughly to understand the subject. These three elements are:

- Repeatable processes: eliminating inefficiencies, optimizing effectiveness and managing exceptions.
- Optimized assets: managing core versus non-core activities, optimizing locations and establishing virtual operations.
- Integrated operations: optimizing global competencies via partnership and managing end-to-end processes on a global basis.

Lubowe et al. (2009: 24) noticed in their study that 95 % of the case companies focused vastly on repeatable processes. First step in establishing repeatable processes is to eliminate inefficiencies from the process such as reducing cycle time, removing unnecessary steps, processing things simultaneously rather than sequentially, when possible and replacing manual work with automation if possible. Second step is to optimize the effectiveness in terms of quality and customer satisfaction. The target is to improve quality particularly on the customer critical areas. This can be achieved by measuring the quality, governing the process, and creating risk mitigation for the process. The risk planning should include every possible risk with back-up plans to counter to handle them. The third step is to manage exceptions throughout the process. Managing exceptions means standardizing the global processes as much as possible while keeping the local differences in mind. (Lubowe et al. 2009: 24–26.)

Optimized assets have become increasingly important aspect of the global integration with the rapid development of the information technology. With the help of financial systems and strong management information the companies can determine, which activities can produce the most value for the company. Activities that are the most profitable can be classified into core activities, while the other activities are non-core. Managing the core activities is a crucial step for optimizing the assets and possibly eliminating or outsourcing weak processes. Global operations require the companies to

optimize their business locations on global basis since the work should be performed where it is done in the most efficient manner on reaching various goals. These goals can be for example materials, talents, resources, distance to markets and other key factors of production. Third aspect of asset optimization is employing the information technology as a mean to communicate globally reducing geographic barriers between the units. (Lubowe et al. 2009: 26–27.)

Integrating operations can be achieved through partnership or managing end-to-end processes globally. Entering a new market is always a challenge for the companies, and to mitigate this process the companies are employing partnering strategies. With the help of information technology the companies can communicate more easily with the partners, and the co-operation is more efficient. When bringing all the aforementioned elements together the final step is to manage the overall end-to-end process on a global basis. To succeed in this, the company needs a complete view of the operations with all the relevant data in one place and monitor the process. The integration process is a continuous process and actions are taken when needed with a focus on global optimization. (Lubowe et al. 2009: 27–28.)

Aforementioned framework provides for this study a comprehensive view of implementing global operations but on a much larger scale what is sought in this study. The aim of this study is to improve and standardize the global operations, which fall under category “repeatable processes”. Global aspect of this study is to bring data and knowledge together in one database representing the “integrated operations” of the model. The integration process is performed with the knowledge acquired through the literature while paying attention to communicating the use of the database. The PG operations manager that initiated this project performs prompting the use of this database. Berente et al. (2009: 137) also highlights the importance of documentation process in the integration process and the significance of understanding the actual use of information, its relevance and its destination. These subjects were analyzed and determined in the design phase of the database.

2.4 Knowledge management

Knowledge management (KM) is a field of study, where knowledge or intellectual capital of the employees is seen as a strategic resource. The organizations are figuring

out the best ways to formulate this knowledge explicit and manage it so that it reaches other users and benefit the whole organization. The nature of knowledge is the greatest challenge in the knowledge management since it resides in the minds of employees and is hard to document. The content of the database established in this study is mostly information, but knowledge is implemented in the standardized global guidelines within selected processes. Understanding knowledge management will provide a good basis for those sections of the handbook. In addition, it will provide possibilities for future implementation to broaden the content to include more knowledge in the database in the future.

Successful implementation of knowledge management changes the way organizations, and individuals' work and change their values and beliefs. This helps companies to utilize the acquired knowledge and provides a better basis for the leaders and employees to act in different situations. Increased knowledge often leads to better decision-making benefitting the entire organization. Increased knowledge also induces double-loop learning that targets on removing the underlying cause of an unwanted behavior or faulty component. (Call 2005: 22–25.) The existing literature has identified numerous barriers that complicate the knowledge management efforts in the companies. The most common barriers identified in the literature are:

- Fear of losing chance for personal success by sharing knowledge “knowledge is power” (Goman 2002: 2; Bartol & Srivastava 2002: 65; Skyrme 2002).
- So called “unconscious competence”. People are insecure about the value of their knowledge (Goman 2002: 2; Skyrme 2002).
- Lack of trust (Goman 2002: 2; Skyrme 2002).
- Lack of time and resources to create and transfer knowledge (Bartol et al. 2002: 65; Skyrme 2002; Riege: 2005: 26).
- Lack of transparent reward and recognition system to create an knowledge sharing environment (Bartol et al. 2002: 65; Riege 2005: 26).
- The attitude not to accept help from external sources, the so called “not invented here syndrome” (Skyrme 2002; Riege 2005: 26).
- Top-down decision-making and knowledge flow (Skyrme 2002; Riege 2005: 26).
- Internal competition between the employees, business units and functional areas can be high and can lead to concealing of knowledge (Skyrme 2002; Riege 2005: 26).

These barriers influence especially when building a knowledge creating and sharing culture for the whole organization. For this research it is important to take into account these barriers on individual level when communicating with the process masters. Hansen, Nohria & Tierney (1999: 1–2) identify two possible approaches for knowledge management on an organizational level to help the organizations in their KM projects. The first one is called codification strategy, which involves codifying knowledge into databases to be accessed by the users. The second approach is personalization strategy that encourages knowledge sharing in person-to-person contacts. The codification strategy represents the goal of this research project.

Understanding knowledge management requires understanding the definition of knowledge. Knowledge is often not coded, audited, inventoried, and stacked in warehouses but scattered, messy and, easy to lose (Galagan 1997: 20–21). Knowledge is outcome of processing, creation and, use of information within the users mind. Organizations can support the employees' knowledge creation encouraging creativity and providing context to create knowledge. (Nonaka & Takeuchi 1997: 14.) According to Nonaka et al. (1997: 14) transforming tacit knowledge into explicit knowledge on individual level is created and expanded through social communication between tacit and explicit knowledge. This process is divided in four sub-processes: socialization process, externalization, combination process and internalization. The model is illustrated in the Figure four.

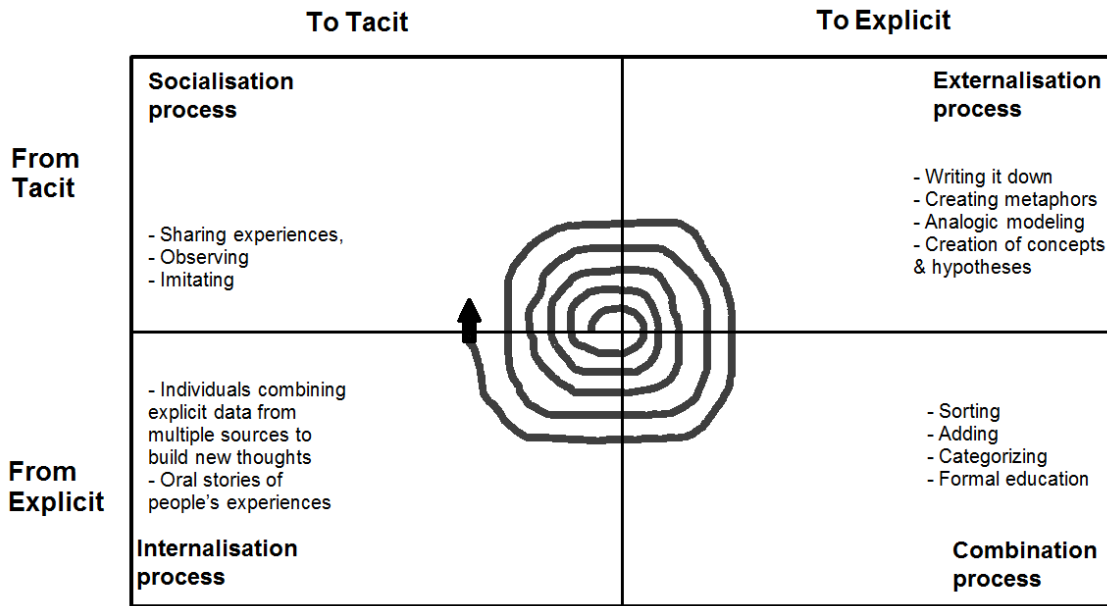


Figure 4. The primary processes of knowledge conversion. (Nonaka & Takeuchi 1997: 15.)

Figure 4 illustrates that knowledge creation is continuous process and requires the attention of the company. Each of these sub-processes requires different types of enablers from the company to be successful. Socialisation requires developing person's social interaction to improve the communication between the employees. Externalisation necessitates a climate to support the use of analogies and metaphors to develop dialogue and collective reflection. Combination requires connecting the newly created and existing knowledge to the entire organization. Internalisation requires the employees to find opportunities to learn by doing, hearing, or seeing to gain new insights. (Nonaka & Takeuchi 1997: 15.) This model represents well the process the author of this study using while transforming information into knowledge, and storing the acquired information and knowledge into the created database. Identifying the essential factors in the knowledge conversion, it helps defining the best way to formulate the database to support knowledge transfer and embedding this in the case company. The established database should also encourage communication to form a foundation for individual knowledge creation.

Armistead (1999: 145–146) formulated a model for knowledge management to create, transfer and embedding knowledge. This model consists of the inputs required for each step and the expected outputs. The measures of each step are also included in the model. The figure below demonstrates these processes with all the relevant information. While

the model proposed by Nonaka & Takeuchi provide a comprehensive general view of the knowledge conversion, the model proposed by Armistead offers a more practical approach for organizational knowledge management with concrete inputs, outputs and measures of each process.

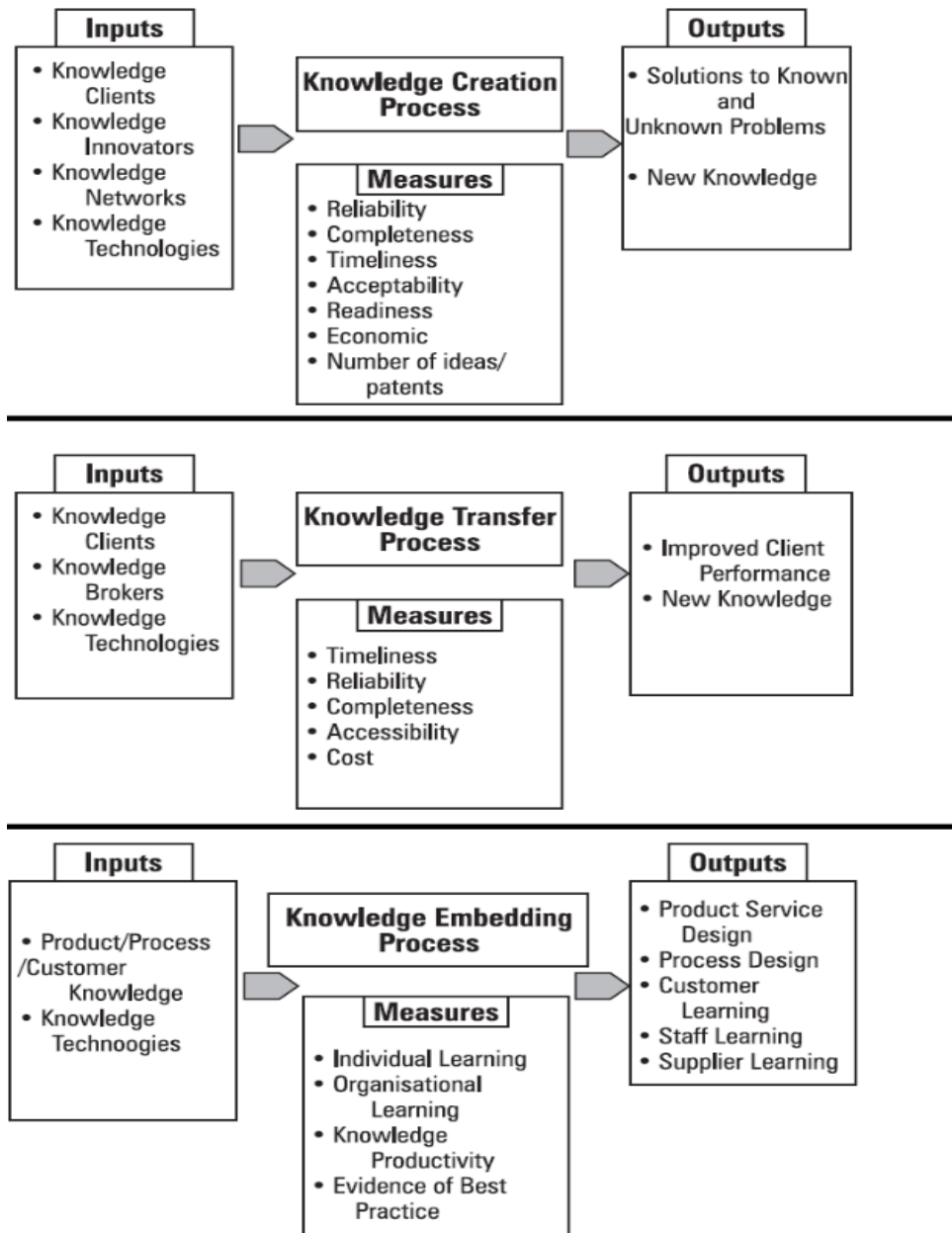


Figure 5. Knowledge creation, transfer and embedding processes (Armistead 1999: 145–146.)

This study utilizes all of the three processes presented in Figure 5. The knowledge creation aspect in this study is the creation of global guidelines for selected processes. The inputs for these guidelines are attained from the process owners and then combined into a standard model. Knowledge transfer and embedding processes are included in the database creation and implementation. Most of the information inputted into the database consists of existing knowledge of the process owners. This data is then processed to include all the relevant information and knowledge in comprehensive form to support the knowledge creation in the user's mind. The embedding process is seen as the use of the created database in this case study. This database contains mostly information and knowledge. The aim is to provide the users with knowledge of the operations, and information to support the knowledge creation.

2.5 Transparency in operations

Klotz et al. (2008: 632–633) noticed a clear positive correlation between process mapping and transparency. They analysed the effects of transparency on corporate processes on two levels: macro and micro levels. They also concluded that process mapping increases transparency by 5 % to 27 % on average depending of the level and aspect observed. This is a significant increase in transparency, but it is to be noted that this is a single study, with one case company with only one method of process mapping. Despite the limitation it proves that it is possible to gain significant improvements on transparency with these actions and lead us to believe that increased transparency can be achieved in this study as well. This study seeks to increase transparency through process documentation, standard global procedures and harmonized information regarding selected topics. There is relatively little literature regarding the effects of transparency in the business operations. Most of the literature regarding transparency is linked into corporate communication.

Transparent process means that the users can see and understand the necessary aspects and status of each operation constantly. Process transparency is even recognized as integral part of continuous improvement in lean production theory. (Klotz et al. 2008: 625.) Bauch (2004: 21–22) defines transparency as the goal that every person involved must be able to see and fully understand the different aspects of the process and its status at any time. Jahansoozi (2006: 943) proposes that transparency increases trust and commitment between the stakeholders and helps the organizations pinpoint where the

responsibilities of certain tasks lie. The increased trust contributes to growth in accountability, collaboration, cooperation and commitment between the users. (Jahansoozi 2006: 943.) The different stakeholders in this research could be, for example the PG and PU management and the different functions (PU and PG functions). Klotz et al. (2008: 625) claim that transparency enables better participation in the process, improves decision-making, and increases the number of possible stakeholders. The stakeholders can identify problems and evaluate the efficiency within the process more easily, when it is transparent thus improving overall process performance (Womack & Jones 1996: 253; Bauch 2004: 6; Graebisch 2005: 75). It is one characteristic of a transparent process that the feedback is acquired swiftly and it is easily measurable (Bauch 2004: 6). It is also important to improve the transparency of communication so that the intent of the sender is easily interpreted and understood to remove chances of misinterpretation (Graebisch 2005: 33). In the end all of these benefits attribute to greater level of improvements in the process and efficiency.

Ordinary issues with bad process transparency are unclear responsibilities (Graebisch 2005: 118), lack of trust between the stakeholders (Jahansoozi 2006: 943), information hunting (Graebisch 2005: 119–120), and fear of misuse of transparent processes and providing the competitors with an advantage (Klotz et al. 2008: 625). These issues are present within the case company of this research, but implementing the handbook should be able to mitigate the problems and increase the transparency of the global order-to-delivery processes. Measuring the level of transparency can be though because of the nature of it. Klotz et al. (2008: 629–632) measured the effects of process mapping in transparency by performing exams of equal difficulty before and after showing the employees process maps of the processes. They also conducted a subjective survey regarding the topic on a five-point Likert scale. The employees perceived the project to increase transparency on an average score of 3.7, which is quite high. For the purpose of this research it is more feasible to measure the results on subjective level using the Likert scale than to use the exams.

2.6 Information systems

Increased globalization and more advanced systems to run the company operations have resulted in an enormous growth in the amount of data the companies have in their disposal. At the same time, the information needs are rising resulting to a need of

quality information (Hosnavi & Ramezan 2010: 31). The information need can be facilitated by developing information systems to meet these requirements. The case company has already abundance of different information systems, but there is an ongoing project to integrate much of them in one common system (Microsoft Sharepoint). Establishing the database of this project in the Sharepoint is a natural choice since the users are already familiar with it. However, it is important to know the factors influencing the IS development strategy identified in the literature. The need for these common databases derives from the globalization of the company and the need to share information and knowledge between each geographically dispersed location. It is known that globalization increases complexity of the process by presenting new variables and unknowns in the process (Akmanligil et al. 2004: 46). Codifying common information and knowledge within this database can reduce the variability of the processes. It can be seen as an aspect of enterprise integration (EI). Enterprise integration in general is the tasks of improving the performance of large and complex processes by managing the interaction between different users, functions and units (Petrie 1992: 1). There are various researches available in the literature for information systems for different functions, such as quality (Nookabadi et al. 2006), manufacturing (Zhuang et al. 1994), and execute management systems (Kumar et al. 2001; Salmeron et al. 2001).

Information systems can virtually include any kind of content the company requires. The IS project often begin by defining the requirements for the system, it is even considered one the most essential stages of the process. Determining the requirements can be divided in three phases: defining the properties of the system, collecting data to identify information needs for the new system, and choosing the best set of information requirements. (Shi, Specht, Stolen & VanWetering 1996: 10.) Akmanligil et al. (2004: 48–50) proposed a general framework for developing a global information system. The structure for this framework is presented in Figure 6. This framework consists of four different variables (Organizational characteristics, system characteristics, differences among subsidiaries and headquarters, and IS department's characteristics) that all impacts to the selection of development strategy. The output of this framework is the information system along with its success. These factors have been identified through the review of IS literature. (Akmanligil et al. 2004: 48–50.)

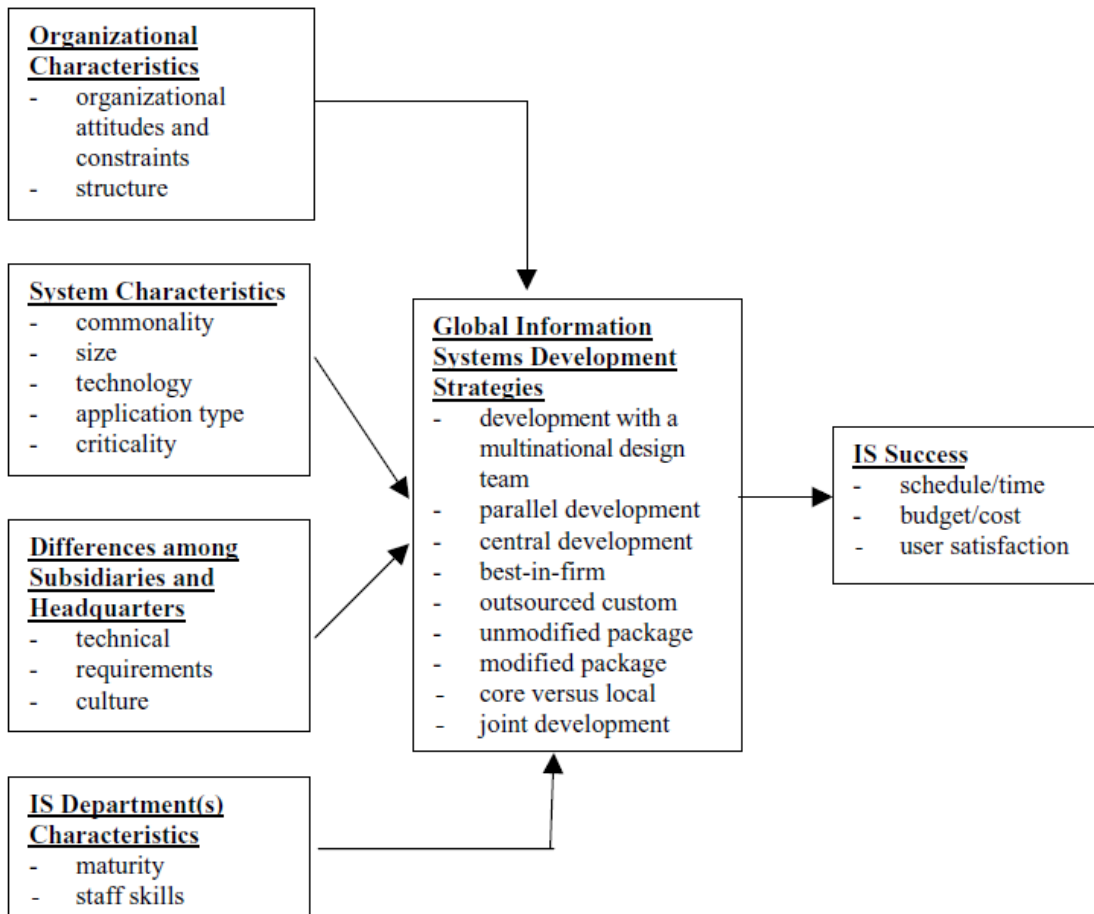


Figure 6. Global information system (GIS) development framework (Akmanligil et al. 2004: 48).

The strategy used for the development of global information systems is determined by the nature of the company, and it can be defined using the four variable groups presented in Figure 6. The organizational characteristics are defined by the structure, attitudes and constraints. The different attitudes and constraints are often unique to each company and hard to generalize. (Akmanligil et al. 2004: 48–49.) The environment and the strategy it is operating on may have a major impact the company structure. Ghoshal & Nohria (1993: 26) defined four different organizational environments for multinational companies: global environment, multinational environment, transnational environment, and international environment. Global environment is an environment that has strong international focus, but the local responsiveness is weak. The multinational environment means having a strong emphasis on local responsiveness but a weak global integration. Transnational environment stands for having both of the above-mentioned

aspects strong, while international environment both aspects weak. The system characteristics are made up of organizational commonality, size, technology, type, and criticality. Commonality is the level of corporate software that is used in global basis. The size of the IS project affects the risks significantly. Implementing new technology often increases the project risk but is easily mitigated by hiring a technically skilled outsourcer. The application type has a strong interrelationship to the chosen strategy and the risk of the project increases with the complexity of the system structure. The criticality of the system is defined by the designed use of the system. For example, a system that improves the company's core competencies can be considered a critical system. (Akmanligil et al. 2004: 49.)

The different units within the company may have major differences between the technologies they possess, information they needs, and existing culture. Technologies include variety among the hardware and software they use along with their availability. Culture enacts a major role when defining the strategy for IS implementation. (Akmanligil et al. 2004: 50.) Hofstede (1980: 69) classified organizational culture on four dimensions: power distance, uncertainty avoidance, masculinity, and individualism. These cultural traits can be used to measure the culture of an organization and individual units, but also the culture of an operating country as well. These differences may result into different means to operate under similar situations within the company. The last group of variables, which affects the IS project, is the IS department of the company. The maturity and skills of an IS function often determines whether or not to outsource the development of the IS. The difference in skills between the different IS departments could also rule out the parallel development. In general, the companies are able to reduce the risks related to IS projects by outsourcing the whole process or certain aspects of it. (Hofstede 1980: 69.)

Information system development or acquisition can be performed on various different strategies. Akmanligil et al. (2004: 46) compiled a list of often-used information system development strategies:

- Development with a multinational design team
- Parallel development
- Central development
- Core versus local development
- Best-in-firm software adoption

- Outsourced custom development
- Unmodified package software acquisition
- Modified package software acquisition
- Joint development with vendor

Selecting the correct strategy is a major problem for the companies that want to maximize the net present value of the software acquisition or development (Akmanligil et al. 2004: 46). The success of an information system can be measured on six dimensions: system quality, information quality, degree of use, user satisfaction, individual impact, and organizational impact (DeLone & McLean 1992: 60). The success of an information system is the best to measure on subjective scale, since it is the users that know if the system is fulfilling their requirements. These six aspects are taken into account during the planning phase of the project. The relationships of the identified success factors are demonstrated in the Figure 7.

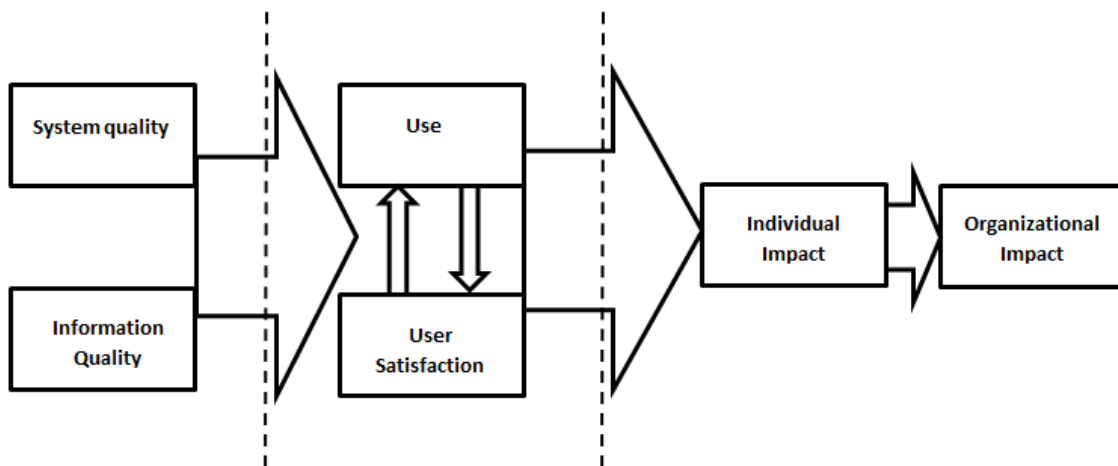


Figure 7. Information system success model (DeLone et al. 1992: 87).

The model above shows the relations between the success factors of an IS project on a very simplified format. In practice these phenomena are complex but the general picture can be seen from this model. Success on each step should lead to success in the next steps and resulting to a successful information system. The scope of this project covers the establishing of the database and therefore it covers basically the system and information quality. If everything there is done correctly, it will lead to user satisfaction and ultimately to organizational impact. The use and user satisfaction will be asked after

the initial user tests, but the long-term development of the system is outside the scope of this project.

Information and system quality are the foundation of a successful IS, as can be seen from the Figure 7. Information quality is a broad concept that has various characteristics. McHaney, Hightower & Pearson (2002: 506) identified five factors influencing the information quality: content, accuracy, format, ease of use and, timeliness. King & Epstein (1983: 36) identified additional factors from the literature influencing the information quality: sufficiency, understandability, freedom from bias, cost efficiency, and comparability. Inability to manage information right or placing inaccurate data in there might cost companies a lot of money every year (Wang 2005: 12). System quality on the other hand focuses often on the performance characteristics of the system (Hosnavi et al. 2010: 31). Panigyrakis & Chatzipanagiotou (2006: 93) compiled a list of factors from existing literature affecting system overall quality: accuracy, process speed, responding time, easy access, and easy to use. Seddon (1997: 246) adds system reliability (“bug-free software”), the user interface, and ease of use in the factors affecting the information system quality.

In this research project the system platform for implementation is given (modified software package), as it is a well known to the target user group, and is already being used within the case company. The structure and the presentation of the information and knowledge are up to the author of this study to decide. The quality of information is most likely the leading concern in this project, but the user interface for the system is also to be considered. As the case company is a major player in the global markets (transnational company), the complexity of process is a significant issue. The development strategy was decided in the beginning of the project (central development), as it is the responsibility of the author to establish the project. This helps reducing the cost of the project and centralizing the relevant knowledge of all the aspects in one place. The development of the project is made in collaboration with the function managers and blue-collars from each PU and CS.

3. CASE AND METHODS

3.1 The case company

The case company of this study is a multinational corporation in power and automation field of operations manufacturing electric motors. In the year 2012 there were on average 145.000 employees in about 100 countries with overall revenue of over €39.000 million. Four driving forces have been set to guide the corporate operations in the company's mission. These four aspects are: improving the customer performance, driving innovation, attracting talent and to acting responsibly. These targets are seen in the everyday life of the company and for example, the significant focus on innovation can be seen as the company spends more than \$1.4 billion annually in research and development. The organization is structured in five divisions that each represents a certain industry sector. These divisions are further divided into business units (BU), which consist of multiple product groups (PG). The production units and central stocks function under the product groups. The organizational structure is illustrated in Figure 2. The aim in this research is focused on one of the PGs and the units under it. The size of the enterprise and global spread of the units presents the company a challenge. The operations are not consistent throughout the whole organizations. This can be seen for example as the customers are complaining that each unit has different procedures to place an order. The company has expanded through corporate acquisitions bringing in various different corporate cultures in the company. This has resulted into a wide range of different procedures between the units. This is a problem in a corporate level, but reaches all the way down to individual production units.

3.1.1 The product group

The organizational level PG was initiated in 2011 being fairly recent change in the organizational structure. This was a major shift within the company and a lot of work had to be done to facilitate the new organization, since the old structure was completely different. The old structure was more factory centric, meaning the factories handled every function related to the products they manufactured. The PUs had more control over their activities, and the global synergy was poor. This resulted in situations where there were similar products made in multiple locations without a common price list. This led to internal competition that was harmful for the company. In addition the units

were free to perform the operations the way they wanted. This meant that there was no harmony between the units, they used different systems to run their operations and the communication between them was frail.

In the new organisational structure the PG level assumed the decision-making responsibility from the PUs leaving them in charge only for the production matters closely related to it. The global manufacturing strategy is now well defined, and every unit is working to achieve the common goals. Sales support, technical support and research & development were also centralized globally in few locations to improve the overall efficiency, response time and quality of the service. These procedures are now uniform regardless of the location of the customer. There have been many projects (see section 3.2.4) to integrate the operations and codify the current structure but even still after two years the company is still facing problems regarding differences in procedures between the units. These problems are further analysed in section 3.1.3. Harmonizing the operations globally concerning order-to-delivery process is fixed even further as the next target and this project was initiated to achieve that. The most visible proof of this is that the information and knowledge is scattered around various databases and in the process master's mind.

The product group in this case is specialized on manufacturing electric motors with units located throughout Europe and Asia (locations presented in Figure 8.). There are currently around 3800 employees on average working within the case PG. The primary targets on operational level in the PG are to reduce lead-time of the production and increase the on time delivery sustainably over 98 % globally. To achieve these targets the company has to improve the global coordination and effectiveness even more while maintaining high performance on each production unit.



Figure 8. Locations of the production units and central stocks of the PG.

There are over 10 000 different motor types manufactured within the PG that are divided in various motor families suited for different purposes. The product offering reaches from small stock motors (basic models) to large motors customized for the customer's needs. Under most cases the motor is manufactured in the PU and transported to a designated CS from where it will be shipped to the customer. Each CS is assigned with an area of responsibility. For example the CS in Sweden is responsible primarily for deliveries in the northern Europe. Figure 9 illustrates the PG's organizational structure.

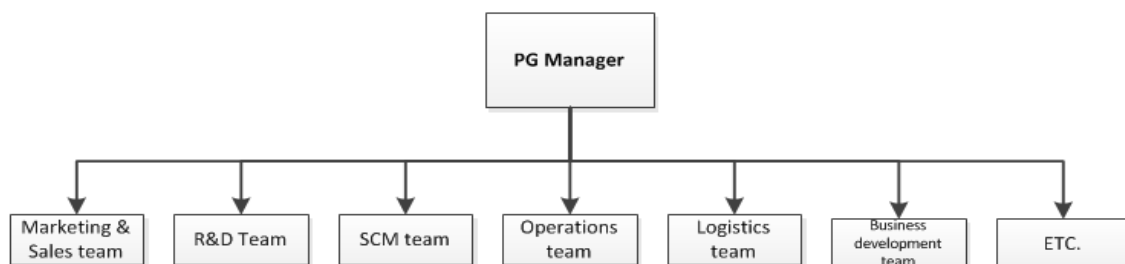


Figure 9. The PG organization structure (few PG functions were left out for the sake of anonymity of the company).

The organizational structure within the PG (illustrated in Figure 9) is built around different management functions that consist of group of people. The aim of these teams is to manage and support the local function teams in each unit. The PG management handles the more strategic decision while the local functions ensure the operational success. The global sales support (GSS), technical support (GTS), and research and development (R&D) work under these PG teams. Visible benefits from implementing the PG level have been the ability to form a uniform reporting structure to include every unit and the possibility to compare them based on these reports. Measuring the performance of each unit on common metrics allows better target setting on a global level. Each of the PG function measures their success on different key performance indicators (KPI) depending on the nature of the respective function. An example of the positive development in the operations is the on time delivery (OTD) that has been steadily climbing towards the target. Before the PG level, the production units were using different methods in measuring KPIs and they were not always comparable with each other.

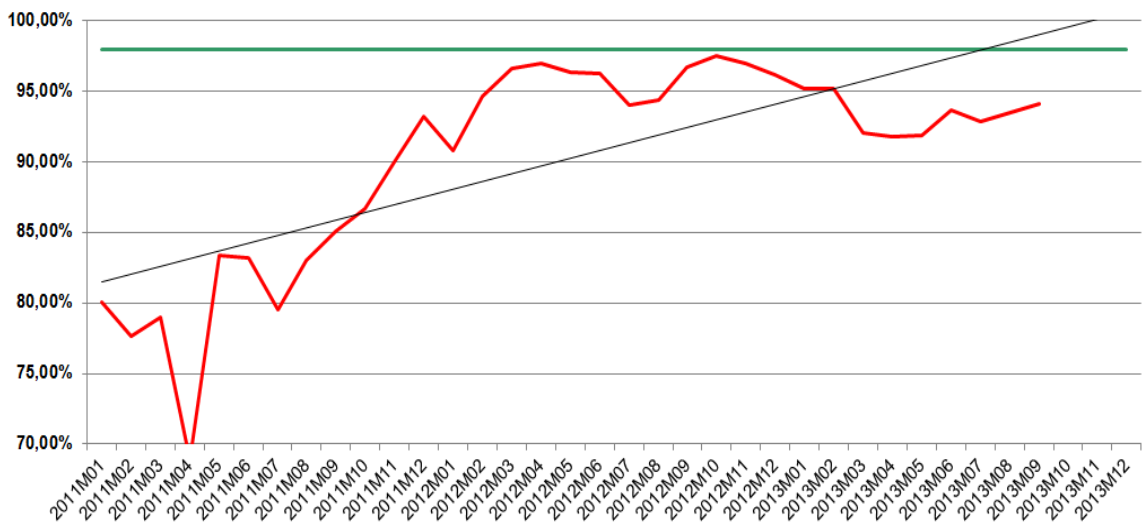


Figure 10. The development of the PG OTD over the course of three years. (PG monthly report 2013, September)

The red line demonstrates the development of ex works OTD ranging from 2011 to 2013. Green line is the set target level and the black line is the linear development. This graph includes the progress of every PU combined over time showing the significant

improvement on the delivery performance. Similar development can be seen on other metrics as well.

3.1.2 Existing operations

The existing PG operations are affected by a huge number of different variables in the process. The essential variables identified for this project are: the number of different motor variants, production strategies, operational strategies and the means used to perform the tasks. The products are allocated in seven different product families that have a number of motor variants under them. The customers are given the possibility to customize these motors to vast extents increasing the complexity even more. The basic motors are called stock motors that can be delivered swiftly if necessary. These stock motors have a pre-set stock level that are often refilled on a modified reorder point (ROP) -strategy, where a refill order is placed from CS to PU for respective motors when the stock level is below the set minimum level. The stock motors can be slightly modified by customer request in the central stock (for example special colour or added auxiliary). The more customizable products are called production motors. The Production motors are manufactured according to specified customer needs in the production units and they often undergo a number of processes before the shipping resulting in long delivery times (4–12 weeks).

The existing processes within the PG are built around different variables within the processes. The company is currently using two types of different manufacturing models that determine the how the motors are assembled on the production line. The next set of variables is the production strategy used for the production: Assemble-to-order (ATO), engineer-to-order (ETO) & make-to-order (MTO). The special operational strategies (traded and outsourced motors) regarding individual motor types are playing a major role when analysing the order-to-delivery process within the PG. There are certain stock motors that are purchased from external suppliers (outsourced motors) to accommodate the demand in certain locations. Under normal circumstances the PUs are producing the motors for their own region demand needs. There are also situations especially in Europe where the production units cannot provide the central stocks with all the demanded motors. These motors are then purchased internally (traded motors) from the Asian PUs to European central stocks.

The products are allocated in seven different product families that are designed for distinct environments and applications. For example, one of these product families is specialized in electric motors for explosive environments. These families have a number of variants resulting in a vast number of different end products. Managing these complex processes requires deep understanding of the existing processes. Implementing the database in this project aims to increase the knowledge related to these operations on an organizational level. The order-to-delivery process of the PG is illustrated in the Figure 11 on highly generalized level. The unit level functions are presented on the left-hand side, while the PG functions are portrayed on the right-hand side. GSS stands for global sales support and GTS for global technical support that both provide the sales units support in the quotation process.

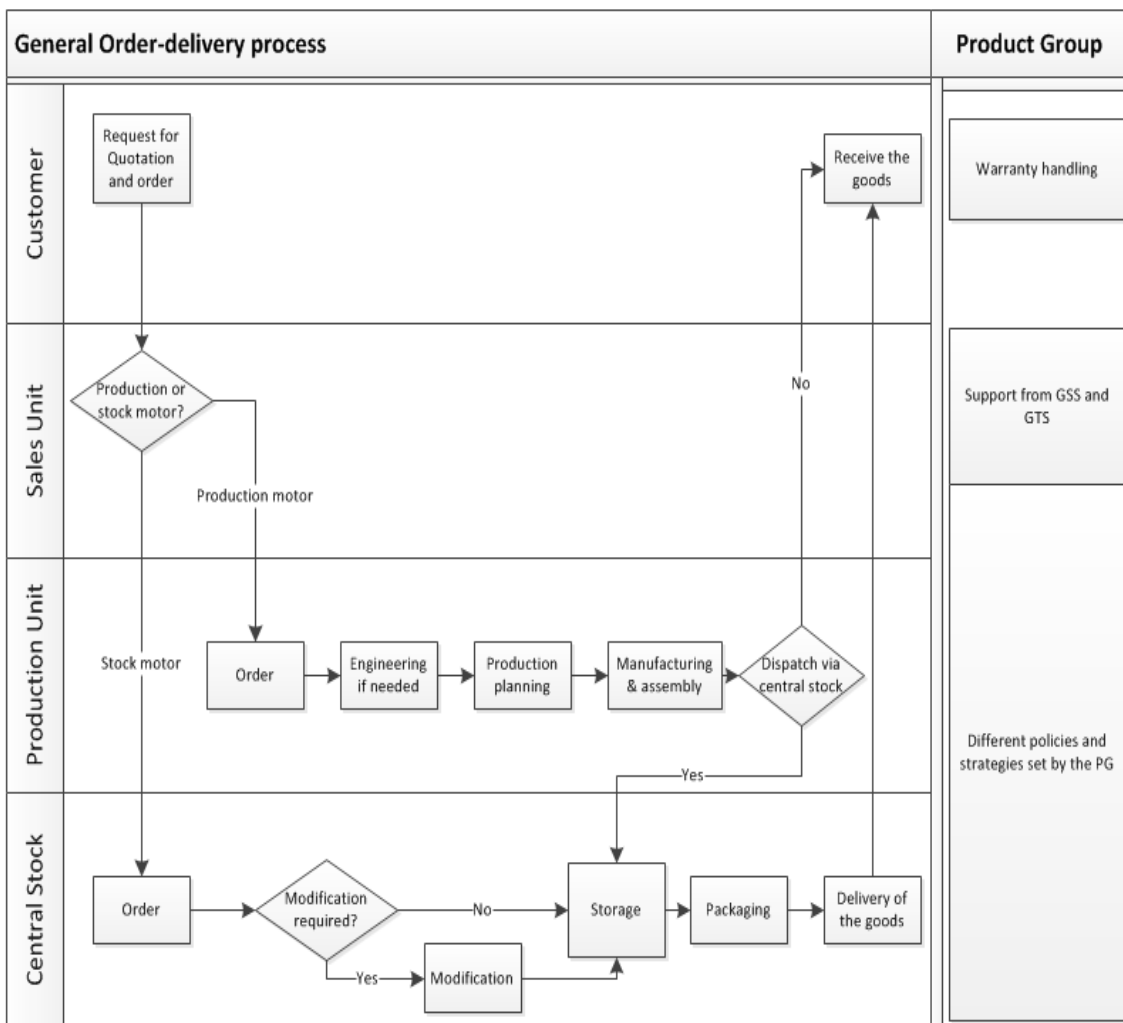


Figure 11. A general view of the order-to-delivery process in the PG.

The case company is using different strategies on delivering the end product to the customer as can be seen from the Figure 11. The three most common strategies are:

- Placing an order to CS, where it shall be delivered to the customer. The CS is responsible for invoicing the sales unit.
- The order is placed on PU, but it will be delivered to customer via the CS. The CS is responsible for invoicing the sales unit.
- The order is placed on PU, where it shall be delivered to the customer directly. The PU is responsible for invoicing the sales unit.

There are also special variants of these, but they are rarely used and disregarded in this research when inspecting the general processes. The units are using a common system platform called order management system (OMS) to place the orders and communicate the order confirmations. Most of the units are already using the OMS, but there are still few locations where it is not used. This leads to difficulties with the stakeholders that have to remember different procedures depending on where to order the motors even though doing business with the same company. Fortunately, most of the units are using the OMS. The problem becomes more apparent when doing business with other PGs of the case company, since each of them have their own procedures and software tools to place the orders and communicate. There are on-going projects to harmonize these procedures but it will take a long time before reaching these goals since project on corporate scale requires a lot of effort and resources to be implemented properly. The case company has harmonized the production level tools, when it implemented SAP in every production unit as the common ERP (enterprise resource planning) system. Integrating SAP further on the other existing systems is not controlled and for example linking it with OMS is not used in most locations, even though it would reduce the manual work significantly. It is up to the units themselves to decide how to use the implemented SAP system.

The functions of the PG of this study are demonstrated on the right hand side of Figure 11. It demonstrates only the order-to-delivery aspect of the PG and therefore is missing some of the other functions it features. Presently the PG level information and reports are shared through a Sharepoint portal. This portal is built around PG functions and the access is limited to only the function each person is working in. This hinders the information and knowledge sharing within the PG and cross-functional communication is basically directly contacting the responsible person. On the other hand limiting the

access to a smaller group of people improves the information security. There is no comprehensive view of the general PG processes available in the systems, and during this project it became apparent that many employees working in PUs are unaware of the organizational structure or the function of PG in the organization.

The company is currently using various Lotus notes based databases and the current information structure is heavily built on top of those databases. There are hundreds of databases within the Lotus notes system, including the company's intra pages. The current system is old and is not able to keep up with newer systems. Therefore, the company has begun a project to update the information structure on a new software platform. Transferring and controlling the transfer of data presents a major challenge. There is a problem of identifying the relevant data from the existing databases to be transferred into new system and how to transfer the existing data into the new system. This research project benefit greatly from knowing of this incoming change since it can directly be implemented to suit the needs of new IT infrastructure. The Sharepoint platform used within the case company provides this project a well-known system for the users, even though it is fairly recently implemented.

3.1.3 Current challenges

The size of the company and the PG under study presents one of the greatest challenges for changing the current operations. The PG organization is able to carry out the change processes within the organization, but it will often require the presence of a number of employees to be successful. Understandably projects that include dozens of people from different functions, assistance from the management team, and affects hundreds or thousands of employees, require a lot of time and resources to be implemented successfully. The differences in procedures reaching from the whole company level to PU level poses challenges as well. Currently there are numerous projects to harmonize the procedures on similar tasks between the PGs and between the PUs. This research project for example is aimed to harmonize the order-to-delivery process and increase information and knowledge of the PG processes. There is also a project regarding warranty handling process that aims to harmonize the procedure on business unit (BU) level. The warranty cases in each of the PGs under the respective BU are handled by the same organization resulting in a uniform procedure. Time frame on both of these projects is more than half a year.

During this research project there were several situations, where even simple information such as the location of the central stocks was hard to find. Only few people had exact information and some of the people did not know where to start searching for this information. In the end it became apparent that this information was only available through various PowerPoint presentations and in certain people's mind. Often the information in these files was outdated. The problem with outdated information can be seen in various locations in the company intra and the existing databases. This summarizes well the problems regarding information and knowledge sharing within the case PG. Another striking problem is that some of the blue collars in the PU organizations are completely unaware of the case company's organizational structure and the function of PG level. There are procedures, tools and documents that are outdated and their use is disregarded in some cases. It might even cause the units to seek out their own methods in performing the tasks. This became especially apparent when looking into the current warranty handling procedures on the PG. There is an official tool for the warranty handling, along with global procedure and documents. The present tool is outdated and some of the units have come up with new tools to cope with the situation, while in some locations the old tool is used. The existing warranty handling documents and templates were outdated and therefore not used. Some of the warranty responsible did not even know of their existence. The database established in this project should be able to mitigate the above-mentioned problems in matters related to global order-to-delivery process, and information and knowledge transfer and sharing. These same problems could be seen in other selected processes as well.

3.2 Planning process for the handbook

The name of the established system is *Handbook for PG order-to-delivery process* since it describes the content and use well. The system includes documented processes and global guidelines (standard means to operate) for the order-to-delivery processes and some processes closely related to it. General PG information is also included to make the processes and organizational structure more transparent. The content and the structure are discussed in more detail in subsection 4.3.1. Documenting the existing processes and transforming them into global guidelines is the most demanding aspect of this project. The general information can be compiled from the existing databases or through the responsible persons quite effortlessly although requiring some work to format in uniform and easily understandable format. The various locations and number

of responsible persons pose challenges for this project, as each responsible person should be included in the project. This will inevitably take a long time and the differing opinions may cause disputes among the people involved of how the global procedure should be structured.

This project is carried out by the company's own project model that divides the project into nine gates. Each of these gates has a set of targets to be achieved, and the project team evaluates the progress after the targets of each gate are reached. In the beginning of the project the targets for each gate is planned along with timetable for the project. The core project team, also called the steering committee, consists of five members: PG Operations manager (initiator of this project), PG Business Development manager, PG Operational excellence Manager, PG Manufacturing Manager, and the author of this study. This team was evaluating the progress of the project and providing support when needed. The planning process for the project was performed primarily during the gate 0 and 1. During gate 0 initial planning was performed along with general outlines of the project. During gate one the project scope was defined and the process planning was finalized. The general model (illustrated in Figure 12) was modified to fit the project at hand. The initial planning of the project was performed in gate 0, while in gate 1 the more detailed structures were presented.

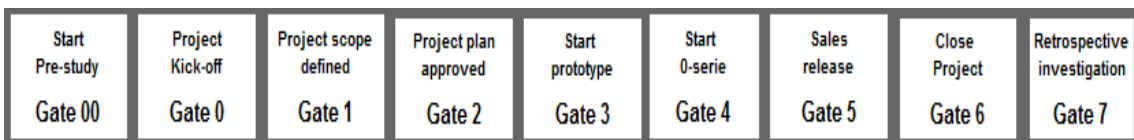


Figure 12. The general process model used within the case company.

Pre-study phase (Gate 00) consisted of learning the company's organization and operations on a global scale. In practice this was interviewing the PG function team members and reading through the materials from the company intra. There were also good e-courses regarding the case company available in the intra on general level. Gate 0 included more research of the current operations along with making various documents from this project. The first proposal for project plan was introduced during this gate. Background work was also performed on the system platform. Based on this work the initial planning was made. During gate 1 the structure and content for the platform was planned. The definition of scope and content was still continued during

gate 2 since it was seen as one of the most crucial aspects of the work. Gate two included extensive research on the research literature available regarding similar projects and related topics. Gate 3 consists of carrying out the process documentation, standardization of selected processes, and providing content for the system. Gate 4, 5, 6 and 7 are more or less outside the implementation process and consist of finalizing, reviewing and analyzing the project in retrospective.

The planning process of this project began when the PG operations manager communicated the use, requirements, and the initial list of topics to the author of this study. The general implementation plan was planned during gate one and employed during the whole project with only minor adjustments. The content and structure for the system was more controversial topic, since all the stakeholders had different ideas in what to include. The planning of content and structure for content began by listing every possible idea for the content to be included in the system. Through discussion with the project team it was possible to narrow the content down to most critical topics identified by the project team. The final structure can be seen from the Figure 13. The order-to-delivery processes in the Figure 13 represent the documented and standardized aspect of this project, while the other topics are generally described to increase information and knowledge regarding these topics.

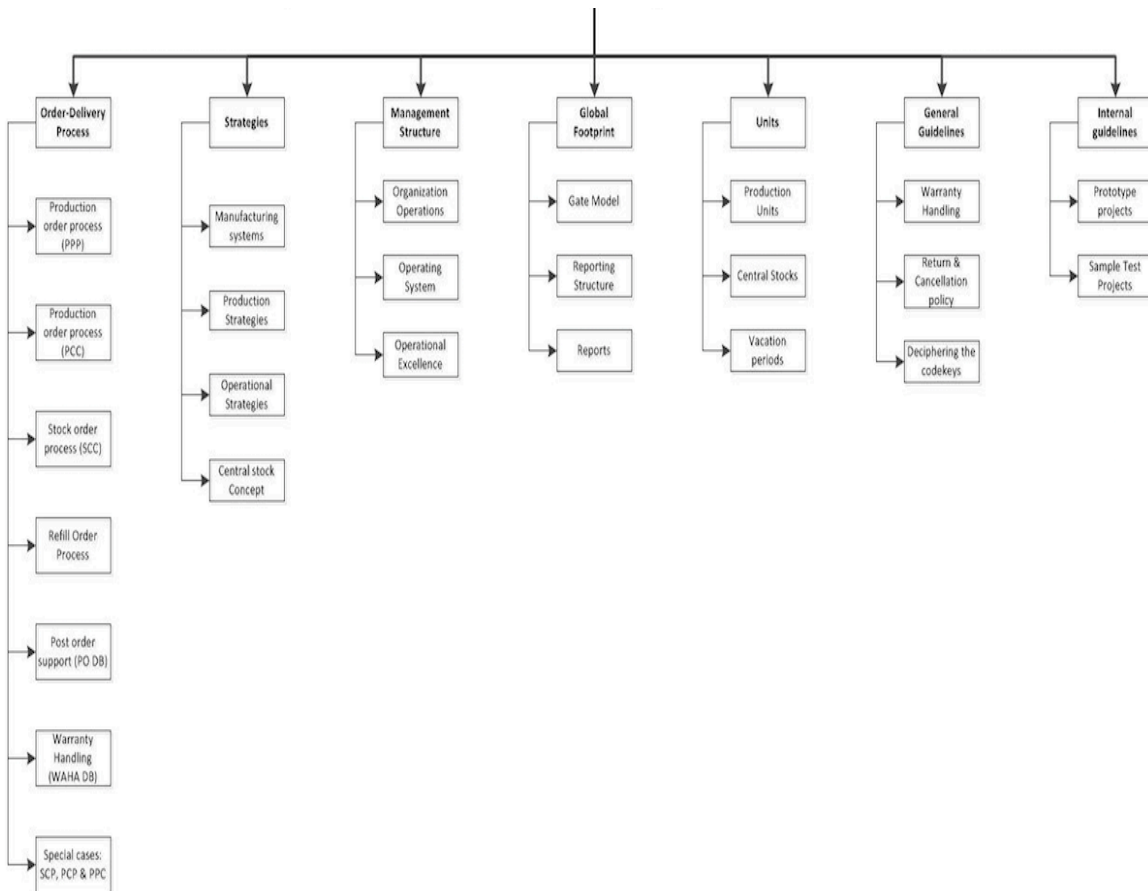


Figure 13. The final structure and content of the Handbook platform (without the subtopics).

The final structure of the handbook was built around seven different main topics that were considered the most important aspects by the project team. The primary focus of the handbook content was on the order-to-delivery processes where the current procedures were documented, and the global guidelines for each of the processes were created. Rest of the handbook content was combining or solidifying the existing information in one place where it can easily be found when needed, and explaining it so that it can be understood without any misinterpretations.

3.3 Information gathering methods

This project includes three distinct information-gathering phases: the general information gathering in the beginning of the project, the research literature review, and the information and knowledge gathering from the process mapping phase. In the

beginning of the project it was necessary for the author to get acquainted with the case company in general, and achieve a comprehensive view of the global PG operations. The information gathering was performed through discussions with the process masters and PG managers, learning the operations through existing process maps, e-learning courses from the company intra, and searching for relevant data from the existing databases. The researcher acquired a comprehensive view of the production unit operations in Finland, and general view of the global PG operations. The local PU knowledge was then broadened to cover the rest of the units within the PG during gate 3.

Research literature regarding different aspects of this study was conducted during the gate 2 providing this project the knowledge of similar cases and topics. Familiarizing with the research literature related to the selected topics provided knowledge how the projects should be carried out. In addition, existing frameworks and information about the identified benefits and risks related to similar projects were available. Unfortunately there were no exactly similar cases in the existing literature. Therefore, this project required combining the results from different fields of research. This phase contributed greatly to the chosen implementation plan.

The global implementation phase of this project brings on challenges regarding information gathering. Much of the existing materials within the current databases are obsolete and it is hard to identify the up-to-date materials from obsolete ones. Fortunately the old documents were able to provide a foundation for information gathering and outlining. Verifying the up-to-date procedures the process owners had to be contacted personally. In many cases this meant contacting the responsible persons in each unit and discussing with every one of them to understand how the process is performed in each unit. The standardized global guidelines were also created in cooperation with the relevant personnel. The discussion process itself forced the process masters in each unit to see their processes through the global point of view and how the global guideline should include the needs of every unit if possible. The current situation in the PG is analyzed based on the experiences and observations of the contact persons and the author himself.

The information gathering has been a continuous aspect of this research, while the nature of the data has been varying through different stages of the research. There was much information available within the current systems and databases throughout the

company. Finding the relevant information was not an easy task even for skilled users especially in PG related matters. Often there are no documentation regarding the PG related matters or they are stored on personal computers. Regarding some of the global operations there are situations that no one knows exactly how it is handled in each unit. Questions related to PG are therefore often asked directly from the responsible persons through phone or e-mails. It should be noted that the PU level information and knowledge sharing was better organized and for example in the PU in Finland there was very well documented PU processes and related information within its databases. Knowledge of the global operations was acquired through the discussions with different people within the organization. The PG opex and Manufacturing managers were available for communication throughout the project and provided much needed assistance for the researcher when needed. Being involved in their daily work also helped the researcher with the information gathering.

3.4 Project implementation model

The implementation process used in this project is created through a combination of the case company's gate model, wishes of the project team, and knowledge acquired through the literature review. Figure 14 illustrates the framework used for this project. This framework provides similar project a baseline to begin projects with general steps included. The general steps of this project were introduced in general in the previous chapters, but here the concrete actions can be seen for each step.

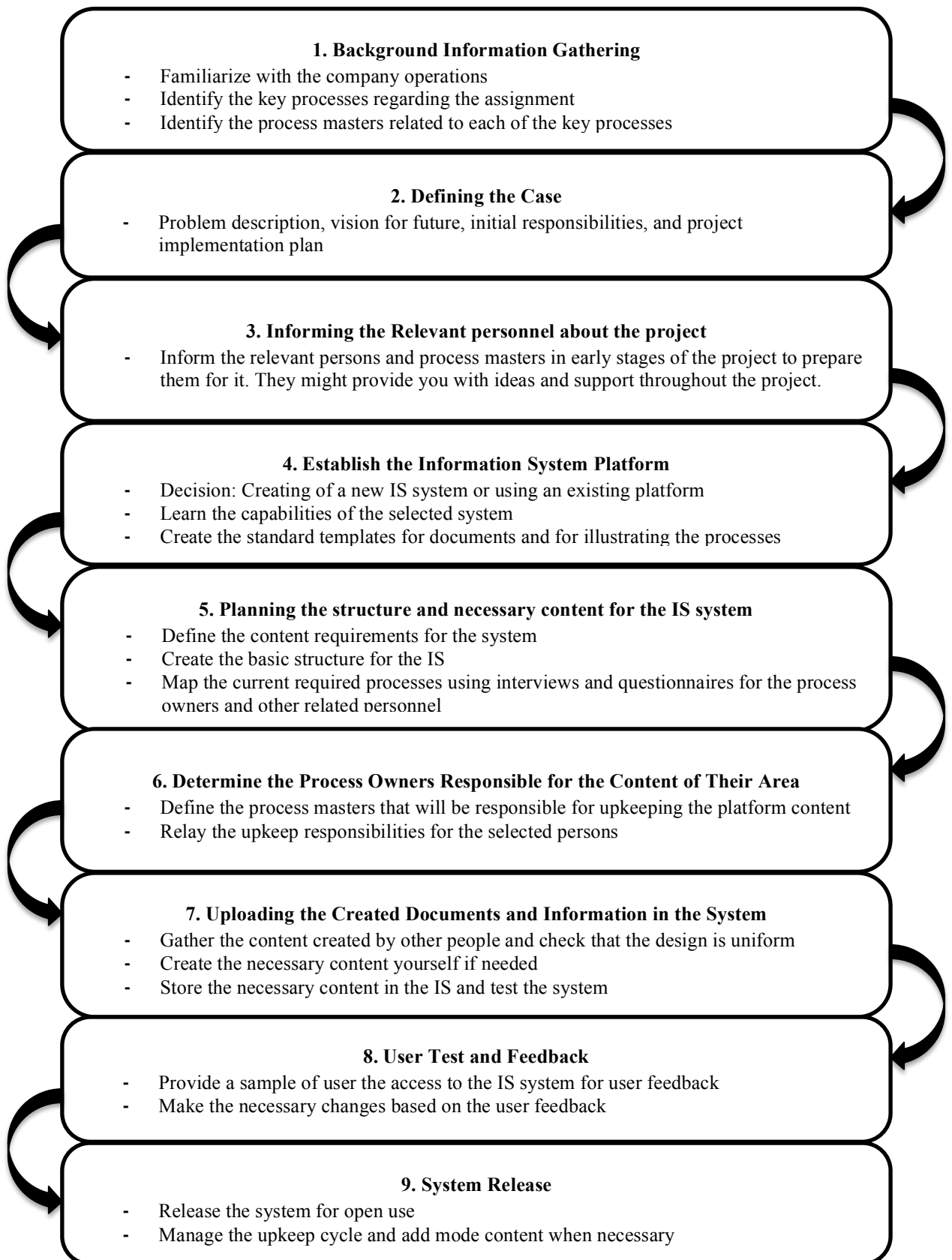


Figure 14. The implementation framework of the project.

The steps identified in the framework represent the most important actions taken during the project identified by the researcher of this project. This is a project with a large number of people involved within various functions and processes. The nature of the handbook content varies within the database as well. Creating exact step-by-step instructions in such environment is challenging and during this research project each topic was treated as an unique sub-project. Some of the selected topics required documenting the existing processes, and creating standard operating procedures for them with the help of respective function employees. On other cases gathering the content for the database was merely contacting the responsible person and asking him/her to fill in the data on pre-formatted document template. The implementation process in this project required significant amount of time because of the number of stakeholders involved in the process. Many of the contacted persons had their hands full constantly, and finding time for meetings or fulfilling actions agreed often required weeks. The contacted persons were often very cooperative since lack of documented and uniform procedures is hindering their daily work in various ways.

The case company is aiming to harmonize and integrate its current operations in general through various projects. This research, being one of harmonization projects, it was natural to select information system platform that is already used within the company. According to the marketing communication manager of the PG, the use of Sharepoint is increasing within the company and even more functions and content are being added under this system. The author of this study was responsible for creating the handbook platform and learning the capabilities of this system was necessary. Analyzing the information needs is a requisite for projects like this, since the users and process masters know best what kind of information or knowledge they require. When the content for the system was created and compiled into the database, it was possible to open the database for a sample of test users. These users were then asked for feedback. Adjustments based on feedback could be made in the system before opening it for everyone. Ideas for future improvements and additional content can also be acquired through the feedback from the sample of test users. After the implementation project was complete, it is crucial to keep the data within the database up-to-date and regularly evaluate the need for improvements. The case company is dynamically changing its operations to meet the current and future market demand, and it often leads to changes within the current procedures. In extreme cases the processes are completely redesigned. The overall process during this project was following the proposed framework in general but in some cases the steps were overlapping one another. For

example the mapping of current situation extended all the way through the producing of content -step.

The general documentation process (Figure 3) proposed by Ugan (2006a: 404) was utilized during the process documentation phase of this project because it provided all the necessary steps needed for successful process documentation. Selecting the documented processes was performed during the planning phase of this project. There were four processes in total to be documented and standardized. Stating the objectives for the documentation was also done during the planning. The objectives set for this project are teaching the current procedures for new or existing employees, standardizing and harmonizing the selected procedures, and gathering relevant information under one database regarding the PG order-to-delivery related processes. The level of detail is set to meet these objectives. For learning purposes a general process maps are created and detailed process maps are made to fulfill the standardization and harmonization requirements. The documentation was performed by the author of this research with the help of each unit's function process responsible (process masters) in each process. The selected processes are already defined in the case company, but these definitions will be included in the process documents created. Measuring the performance of these processes was already determined and these KPIs will be included in the documents. Acquiring the knowledge of the process masters during this project was performed as following:

1. Identifying the responsible persons for the process in each unit.
2. Informing these persons of the project.
3. Contacting these persons and acquiring the knowledge of procedures used within the respective unit.
4. Documenting the knowledge and information acquired through the process masters.
5. Creating a standard operating procedure for the process (global guideline).
6. Send the standard operating procedure to the process masters for reviewing and commenting.
7. Finalize the standard operating procedure based on the feedback from the process masters.

The potential pitfalls identified by Rosemann (2006: 249–254) were also taken into account during the process documentation to avoid failures and common mistakes in the

documentation. The lack of strategic connection and user buy-in are not critical issues in this project since harmonization of these aspects is a commonly known issue, because of that most of the contacted employees were highly motivated to help. Each of the selected topics was assigned with a responsible person for future governance. The company is enormous in size and the lack of synergies is one of the most critical issues of the identified pitfalls. It was impossible to announce this project for the whole company or even the PG. This is an issue that we just had to cope with. The author of this project was working as the primary process modeler, and while he was lacking in modeling experience in practice, he acquired a lot of knowledge from the research literature and the existing process maps found in the company. In the end there were more than 20 process maps created from various topics. The process masters inspected the created process maps to validate their content and understandability. The lack of qualified business representatives- pitfall (process masters) was mitigated through using several process masters regarding the same topic and comparing the information/knowledge to the existing documentation. Cross-referencing the information and knowledge from these various sources diminished the effect of this pitfall.

Creating the global guidelines for the selected processes requires understanding how knowledge is created and managed. Nonaka & Takeuchi (1997: 15) proposed a general model for knowledge creation and understanding the model provided the author of this research a valuable baseline what are the most important aspects of knowledge creation and sharing. The content for the handbook was created with these matters in mind to support the organizational learning of the selected topics.

3.4.1 Upkeep Responsibilities

The Microsoft Sharepoint platform offers a wide range of functionalities and properties for the users. Each of the selected topics received their own Sharepoint portal that was created depending on the information needs of the respective topic. Each of these portals shares the basic layout but could be modified according to the user needs to some extent. The most frequently used functions are file sharing, text fields, internal workspaces for the respective function, and communication hubs. Most of the materials created for these portals were shared through the file sharing function as it provides the users an easy way to upkeep the necessary documents. This gives the files a designated location and everyone with sufficient user rights is able to modify them when needed.

The Sharepoint user and upkeep responsibilities were divided in three categories: viewers, upkeep responsible, and handbook owner. The PG operational excellence manager was appointed the handbook owner that has full rights for the platform. Each of the topics in the handbook was assigned with an upkeep responsible person. These persons are responsible for updating the current material, when necessary, and adding of new content. The handbook viewers have rights to view the handbook and open the files, but cannot modify anything within the pages. The primary owner responsibility is to arrange regular meetings with the upkeep responsible persons quarterly to evaluate the need for changes within each site. In the future the number of these meetings can be reduced to bi-annual or annual if it is considered to be enough. The upkeep model for this case is formatted in a five-stage cycle as illustrated below in Figure 15.

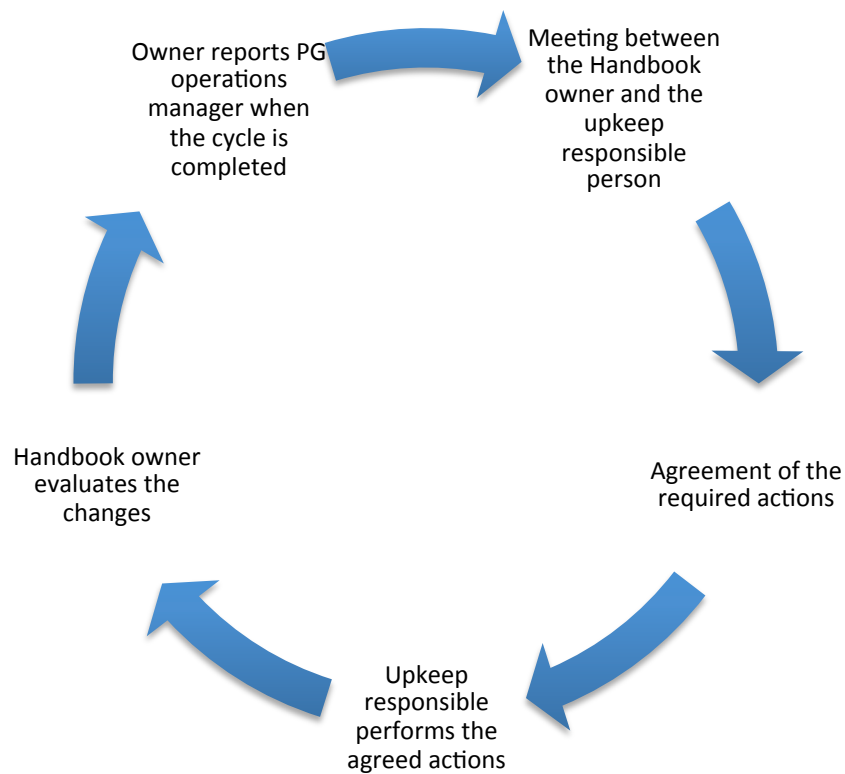


Figure 15. Handbook upkeep cycle.

The Handbook owner is responsible for arranging the quarterly meetings, where she/he discusses the content of each Handbook site with their upkeep responsible persons. These meetings should include at least going through the current content, evaluating the need for additional information in the site or updating requirements, and agreeing the

necessary actions to be taken for the Handbook site. A schedule for the actions is also to be agreed.

Most of the assigned responsible persons have been using Sharepoint before, but only few have had the responsibility of owning a Sharepoint portal. Therefore, various instructions were made during this project for the handbook owner and the upkeep responsible persons to help with their tasks. It was important to have simple instructions for these people within the portal to guide them through the tasks. For example knowing how to add user rights is a prerequisite for the handbook to keep the user groups clean and to manage the list of users efficiently. Through these instructions it is possible to maintain a harmonized Sharepoint structure and make sure the security settings are maintained. Security is crucial when it comes to Handbook platform since it contains plenty of managerial information.

4. RESULTS

4.1 Standard documentation templates

The handbook contains portal sites for each of the selected topics and the design is created in cooperation with the process masters. The nature of content determined how the information should be stored and shared, for example the documented and standardized processes required a great amount of information and knowledge to be stored in easily understandable format, while the more general information sections might only require one document regarding the topic. The aim of this project is to create the handbook platform and provide the minimum content required for effective use of the system. After the system is opened for general use, the responsibility of the content is moved to the selected process masters. These process masters are able to add more information and files into the system to provide even more comprehensive view of the topic. For the sake of uniformity of the documents, standard document templates were created.

The case company provided existing presentation and document templates to be used. A new general PG process map template was created based on previous process maps used within the PG. In addition, a document template was created for process standardization. Using the template for process documentation ensures that all the required elements are taken into consideration, and it provides uniform documentation of the processes. Figure 16 illustrates the basic information required for each document. This format is used throughout the company and is naturally part of the documentation template used in this study. The function of this information field is to allocate the document directly under a certain unit, or an organizational function. It also provides information of the author so that the reader knows whom to contact when necessary. These are necessary pieces of information in a company of this size where the global presence is high, to track the origin of the document.

LOGO	Document kind	Document number	Revision	
Issued by	Author	Date	Language	Pages 1(3)
Division/Department	Approver	Distribution	Status	

Figure 16. Documentation template information field.

The content in the Sharepoint platform can be divided in three different categories: Sharepoint functionalities, free text fields and shared files. Sharepoint functionalities are used on only few pages, where they provide functions that aid the users, for example communication site or calendar with shared schedules. Free text fields are used to welcome the users to the current Sharepoint page and to give a quick summary of the topic and the content. Shared files are the primary means of information sharing in this platform. In most of the cases the topic is presented through a Microsoft PowerPoint presentation giving a good overview of the subject. For the selected order-to-delivery processes a process map and a standard means to operate were also available. The standard operating procedures are recorded in the process documentation templates that include the process map. The process maps are also stored in the original format for Microsoft Visio for further updating. Figure 17 presents the process map template used to document the current procedures in this project, and to create the standard models.

Title	
	Phase
Customer	
Sales unit (SU)	
Product group (PG)	
Central stock (CS)	
Production unit (PU)	

Figure 17. Process map template for the PG.

The process map template was created based on some of the previous process maps created within the PG function and they cover all the necessary factors related to PG level processes. This template can also be used for future process mapping of processes in the PG and even in PU/CS processes.

4.2 Process documentation and standardization

The primary focus regarding the handbook content is on the documentation and standardization of the selected topics. These matters were chosen for this project by the steering committee and were considered to be most important processes related to the order-to-delivery process of the PG. The selected topics are:

- A. Warranty handling
- B. Post order support

- C. Refill order process
- D. Global order-to-delivery processes

Documenting the current procedures and bringing transparency in the processes was required because many of the employees were unaware of the actions happening in these functions, and finding the information is hard. It can be argued that the employees are able to make better decisions in their daily work if they know the general picture better. The driving idea is to bring this information available for everyone that needs it and help to understand the global operations better. The expected users for this database are the people from different functions and units that can learn the general idea, while the people working within the documented function can learn how the process is handled globally in great detail. Providing these functions and units a global guideline on how the procedure should be performed may induce harmonization of the processes in the long run. The global guidelines (standard means to operate) are not forced on the units, but they can be used as a reference when the process needs updating. In this section each of these functions are explained and the current situation demonstrated. The global guideline for these processes are also presented and explained. Some of these selected processes are managed on PG level, while others are managed locally in the units.

4.2.1 Warranty handling process (A)

The warranty handling process within the PG is an important function that handles all the warranty claims. This topic is actually outside the order-to-delivery process but was assessed to be too important aspect to be left outside of this project. The sales units handle the communication to the customer and relay the message to the respective unit. Most of the warranties handling cases are handled within the production units that have produced the end products but there are also warranty handling responsible persons in the central stocks as well. Central stocks are responsible for the warranty cases where the defect is caused by the modification performed on a stock motor. These modifications can be, for example a special paint color or added auxiliaries. The PG target is to serve the customer regardless of the cause of the defect (under / outside the warranty coverage). When the product is still under warranty coverage the options are to replace the motor with a new identical one, or to repair the faulty motor if possible.

When the defect is self-inflicted by the customer, or the warranty has expired, the customer is either offered a repair service or a new product (both for a charge).

Currently each unit runs the warranty handling process independently and it lacks the documented common procedures for most parts. As a result, the current warranty handling procedures are quite different depending of the unit in hand. This causes problems and misunderstandings especially in the sales units that need to know the process for each of these units to provide the customer warranty handling service. Having common procedures would make the work of the sales units considerably easier bringing also transparency in the process. There is an on-going project to bring the warranty handling to a business unit level in the near future, meaning that all the PGs under this specific BU are using the same warranty handling function. This project is however greatly delayed and it will likely take some time to be fully implemented. Documenting the current procedures and creating global guideline for the warranty handling will mitigate the current situation until the new BU warranty handling is in use. The documents created in this research project were even used as a baseline for the new BU warranty-handling project.

Under normal circumstances the warranty handling functions are primarily communicating with sales units but they are lack of horizontal communication with other warranty handling teams. The only apparent collaboration is the common database that is currently being used in three units in Europe. This database is located in a Lotus notes based system. Similar databases are used within other functions of the PG and PUs as well. This database is actually working well at the moment, but there is no future for this system since the company is aiming to switch Lotus notes based systems into Microsoft based systems. The new tool is being developed as part of the project for BU warranty handling. The units that are not using this warranty-handling database in Lotus notes are relying on e-mail and voice communication. The most significant difference in the current procedures is that the warranty handling function in China is functioning under the sales unit, unlike the others that are part of the production unit or central stock organization. Despite the fact that the units are using different tools for the process and are lack of the common procedure, the documentation process showed quite similar general processes between the units. Figure 18 demonstrates the current situation in some of the units and acts as a future guideline for the warranty handling process in the PG.

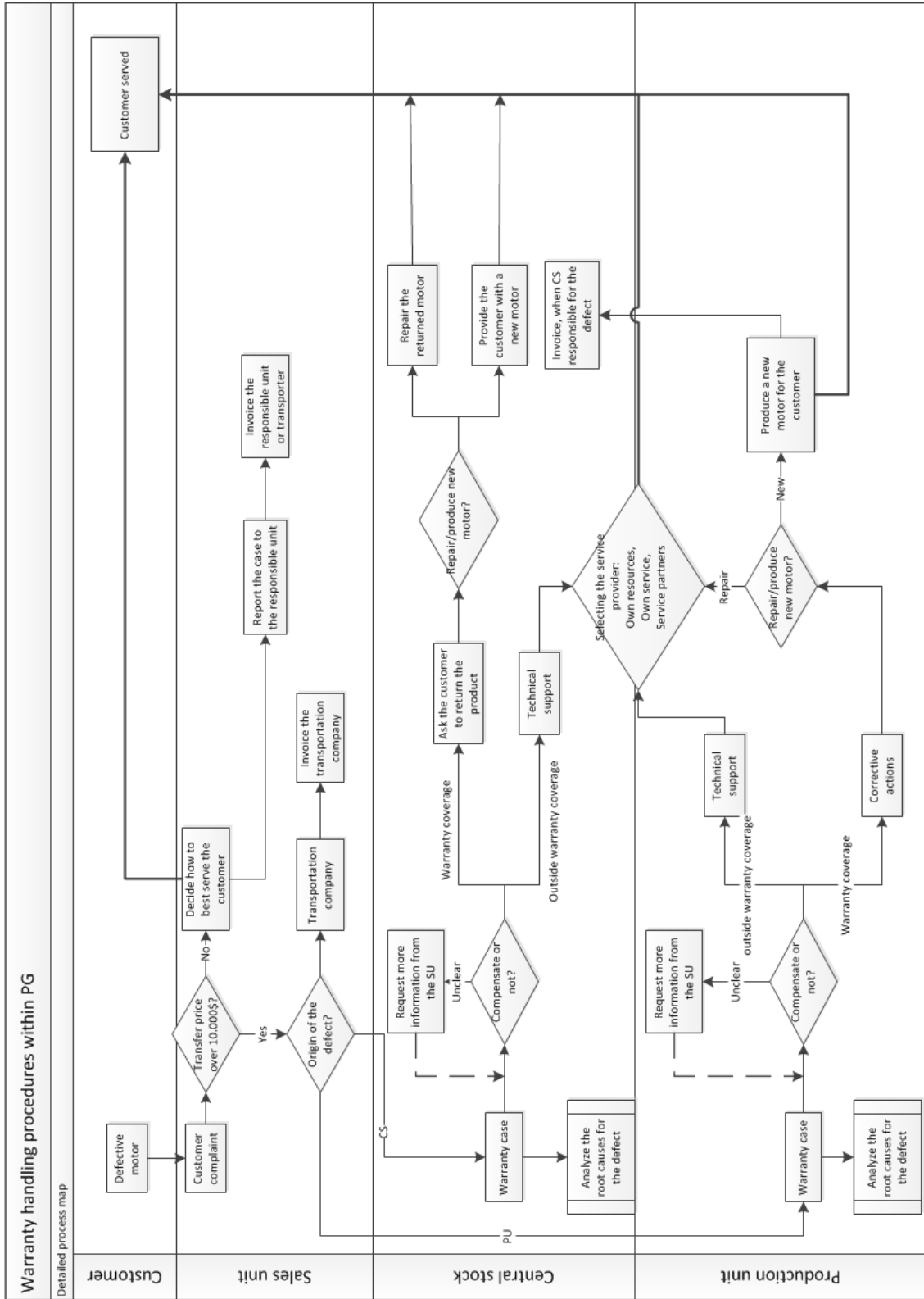


Figure 18. Warranty handling procedures in the PG (the created global guideline).

Figure 18 portrays the standardized model to run the process, illustrates the current procedures in some of the units, and demonstrates the situation throughout the different organizational units. There is an agreement between the production units, central stocks and the sales units that warranty cases that fall below transfer price of \$10,000 are completely handled by the sales units. This means that the sales units can decide the best way to serve the customer and are free to charge the central stocks or the production units for all the expenses related to the handling of the case. The fault reports are delivered in the respective units for root-cause analyzing to prevent similar defects from occurring again. When the transfer price is over \$10,000, it is the responsibility of respective PU or CS to handle the cases. According to European Commission of taxation and customs union (2013), transfer pricing refers to the prices used by multi-national companies when selling or buying services or products from another unit within the organization. The organizations are allowed to determine the transfer price themselves but it has to be close to the actual market price since there is a possibility of tax avoidance if the products are priced too low or too high. The process map illustrated in the Figure 18 was created with the help of each production unit's and central stock's warranty handling responsible persons. These persons informed how the process is handled within their unit and the general process map was created based on the information that they provided. The process map was then sent for reviewing for all of the function responsible persons.

Warranty handling in central stocks is relatively rare and most of the units reported 0–30 cases annually. After discussions with the PU warranty handling respective persons, it became apparent that they are handling cases that actually belong to the CSs. This explains the low number of warranty handling cases in the central stocks. Other interesting difference is that the central stocks most often request the customers to send the defective products back to the CS, where it will be analyzed. The motor is repaired and sent back to the customer, or the product is replaced with a new one. The production unit's warranty handling teams especially forbid sending the product back to the PU unless otherwise agreed. Since the number of warranty handling cases is relatively low, there are no designated warranties handling responsible in the central stocks. The warranty responsible persons in CSs varied from the head of the unit to quality managers, while the cases are mostly handled case by case.

4.2.2 Post-order support (B)

Post-order support is a function where the customer can request for information regarding the current situation of the ordered products. Post-order team is also handling order changes and cancellations for the placed orders. The team handles the internal communication and manages the actions required to fulfill the requests. The sales units act as a link between the post-order support teams and the customers. The target is to provide customers with fast and reliable service. There are post-order teams in every production unit and central stock of the PG, but the operational models are different between the PUs and CSs. The PU post-order teams are responsible for making the changes themselves based on the SU requests. These requests are handled as individual projects, where some are relatively small cases, and the others can be very demanding. The post-order teams in central stocks on the other hand are responsible primarily for answering the questions related to booked orders for the sales units. The actual changes for the products ordered from the CSs are made by the SUs themselves.

The number of the total post order support cases within the last four years has been significantly ascending. According to Puolitaival (2013: 46) one of the reasons for the increased number of post order requests can be the improved documentation of the cases. As the current system was implemented in 2010, it was far from perfect. With the improved user knowledge and system maturity, the reported number of cases is more reliable. In other words, the system is able to capture more of the cases handled. According to PG opex manager, there are still plenty of cases where these requests are handled for example through phone or e-mail, outside of the dedicated system. In general the system is used significantly more in Europe than in Asia. An extreme example of this is the post-order team in China that estimates only 10 % of the total cases to be handled within the dedicated system. It was told that the current system is too slow to be fully implemented but the aim is to increase the use by appealing to the SUs to require the use of this system. The total increase in case number is not however stemmed from the improvement in the system or the users, and there are other unknown reasons still behind the ascending number of cases. The trend with the post-order support cases is upwards, and can be considered a major problem as the changes are often affecting the whole process introducing indirect costs that are hard to invoice from customers.

According to the statistics received from the local post-order team managers, it became apparent that the nature of the requests varies greatly between the units. Units focusing primarily on stock motors the amount of order cancellations and changes are relatively low, as most of the requests are concerning price corrections and delivery times. On the other hand, factories producing more customized products are receiving far more order change and cancellation requests. The most common topics for post-order cases are:

- Inquiring the delivery time
- Cancelling of the orders
- Requesting for price corrections
- Making changes to the orders
- Requesting technical details
- Requesting test reports
- Inquiring for certificates

Many of the more demanding cases are either order changes, or cancellations. The case company has clearly defined policies for the order changes, order cancellations, and product returning. These policies are used globally and are the same for every customer. Only stock products without modifications are accepted to be returned, since most of the other products are so far modified it is not likely to get demand just for that certain product variant. The customers are returned 65–85 % of the product price if the products are returned unused. When cancelling a production order (make/engineer-to-order), the cancellation cost is decided by the time of cancellation (weeks prior to delivery). For the order changes the company has determined a so-called freezing point (FP) where the product design is ready and the manufacturing can begin. Freezing point is determined by the size and type of the motor and varies from four to ten weeks before the acknowledged delivery date. Before the freezing point customers can make changes in the order without affecting the delivery time. If the order change is issued after the freezing point, it postpones the delivery on average by two to three weeks depending of the change requested. After the FP some changes cannot be made, and the customer has to cancel the current order and book a new product if they require the order change.

The global processes are quite well defined for the post-order support in both PU and CS level. The current problem lies with the use of the appointed post-order system, as it is not used in the wanted extent. As there is huge number of cases handled outside of the official system, the company is unable to see what is happening and the operations

are invisible to everyone outside of the local team. Increasing the use of the appointed system would greatly increase the transparency of post-order operations and make the management more efficient. It could possibly pinpoint problems in the local units as well. The contribution of this section of the handbook is to get the general processes documented and explained in detail, and to pinpoint the differences in PU and CS post-order processes and responsibilities. Analyzing the effects of having the common system used in every local team is also performed.

The post-order teams are part of the PG organization but they are located within the production units and central stocks. The process map presents these teams in PU or CS organization to address the physical location and the differences in their procedures. Figure 19 demonstrates the global standard procedure for the post-order handling and Figure 20 the standard order cancellation process. These models are currently being used within the units when the cases are handled through the official channels. However, the system is not used in full extent and there are a huge number of cases being handled through phone calls and e-mails. Using the appointed post-order system is the first priority when harmonizing the global operations.

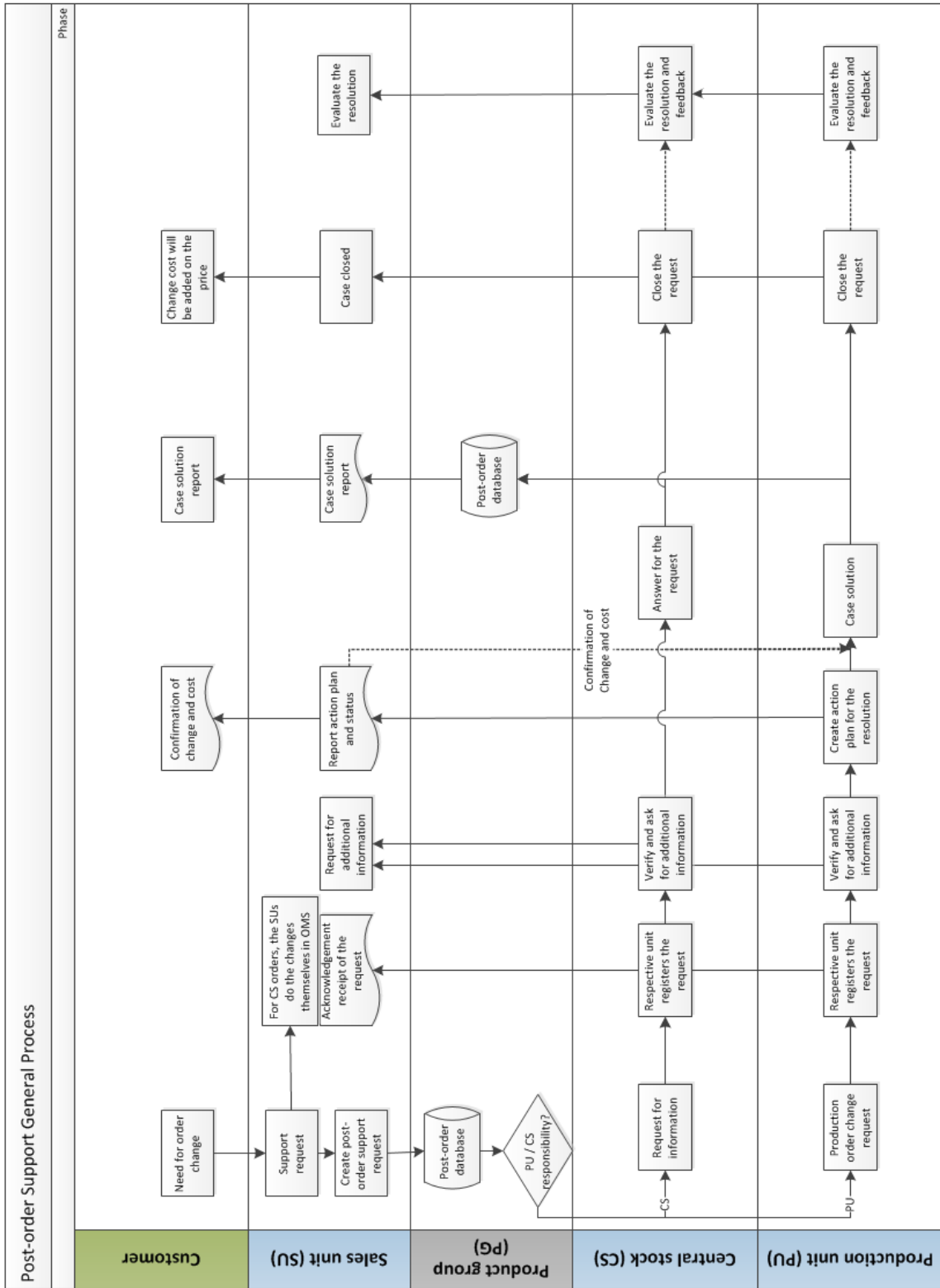


Figure 19. Standard post-order process model.

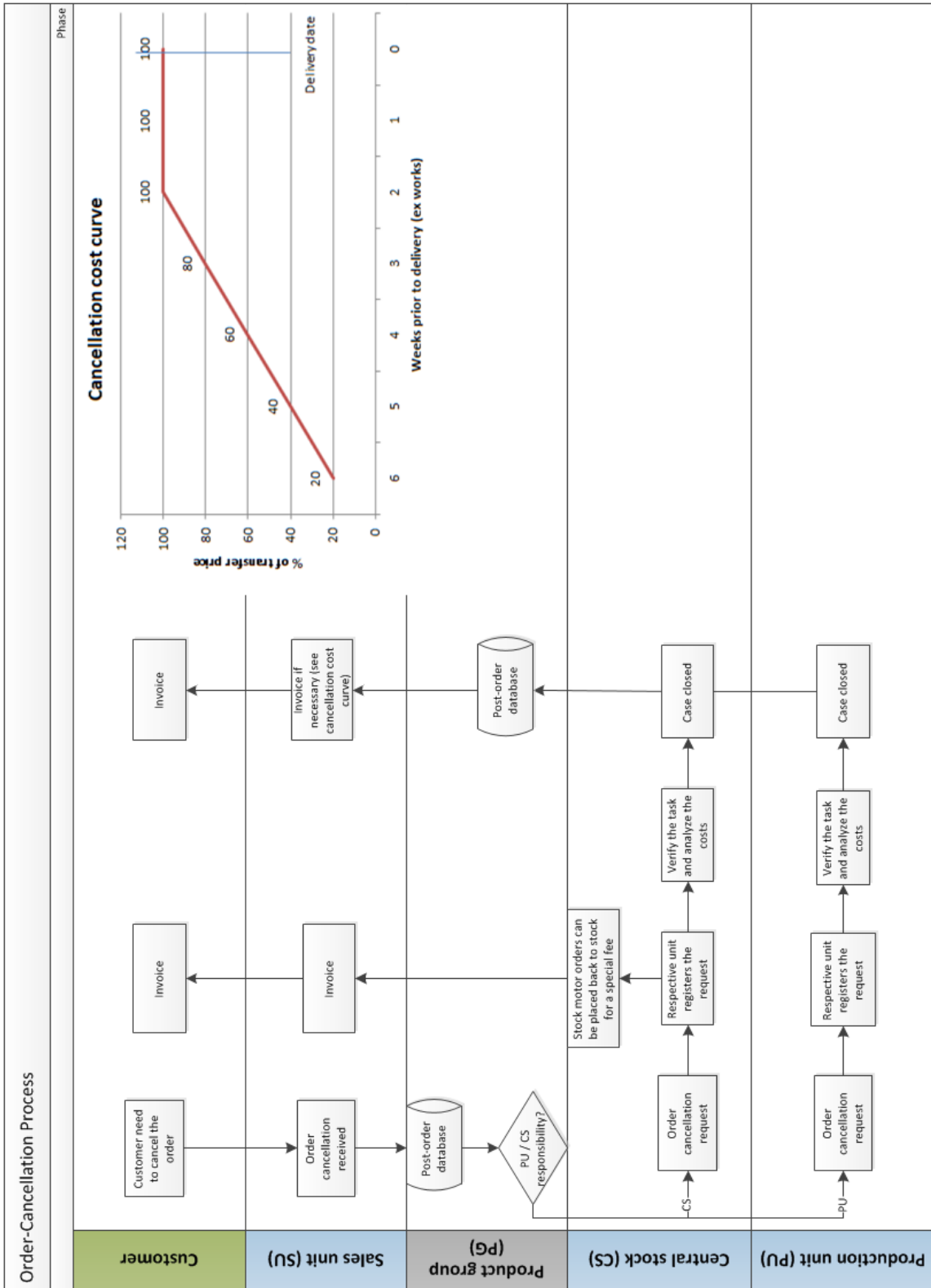


Figure 20. Standard order cancellation process.

The basic process begins with the customer request to the SU. SU then assists the customer with the request, and inputs a post-order request in the common system. The local post-order teams then pick up these requests and start taking actions to answer the questions and/or making the actions requested. The whole process is transparent as everyone with the access to the system can see each open case with all the communication between SU and the post-order responsible person. Therefore anyone can see what is happening with each case, and step-in to substitute during e.g. sick leaves. This system also generates statistics with useful information to manage the process. All these benefits are non-existent when the cases are handled outside of the system. After the responsible person accepts the request, it is his/her responsibility to manage all the actions required to carry out the customer request. This is why the post-order employees are often called project managers. The simple cases can sometimes be easily solved just by looking at the different systems used in the units such as ERP. The more demanding cases might require involving various functions in the process. For example changing the product design might require engineering, purchasing and production planning.

When the case solution is ready, it is communicated to the SU through the common post-order system. The case solution information depends of the nature of the customer request. In more demanding cases the effect on delivery time and price is also included if necessary. The case solution is evaluated by the SU, and the end customer on Net Promoter Score (NPS). The sales units are evaluating each individual case solution on quality and content aspect, while the customers are evaluating the overall service they have received from a longer time period. According to Reichheld (2003: 1) NPS represents the likeliness of the customer to recommend the company to a friend or colleague on zero to ten scales, ten being the best. The scores are divided in three groups: Promoters (9–10, likely to recommend), passively satisfied (7–8), and detractors (0–6, extremely unlikely to recommend). These NPS results are used to improve the process in the future.

The order cancellation is almost identical process in both PUs and CSs and they are handled through the same post-order system used in other cases. The PG has defined the cancellation costs globally and these instructions are followed everywhere. The challenge with cancellations is the same as with the other post-order cases in general. The appointed system is not used in full extent making the overall process to lack

transparency. The cancellation itself means analyzing the cost for cancelling the order and invoicing the customer. Stock motors can be returned even after the delivery if they are not modified and not used.

4.2.3 Refill order process (C)

The case company is keeping some of the most common product codes in stock, to be able to deliver them to the customer faster than the traditional production orders. Refill order process is a continuous activity to maintain the assigned stock target levels in the central stocks. The aim in the refill order process, and the stock management closely related to it, is to identify repetitive consumptions from the customers, and find the best way of having these products available at central stocks in the shortest possible lead time. These processes are maintained by the PG logistics function in Europe and by the production units and central stock in Asia. The Asian units are planned to be moved under the PG logistics function in the near future for to harmonize the overall process and centralize the decision-making under one function (PG logistics). As the process is practiced by a common function in the Europe, there are no significant differences in the process between European units. The Asia on the other hand is currently operating in a very different environment and the procedures are quite dissimilar between the units in there, and with the units in Europe. The process involves both the end products, as well as the modification kits used to modify the products at the CS. The modification kits consist of the parts used for a certain product modification.

The basic idea of the refill order process is that PG logistics function (EU) defines the basic motors to be stocked with a safety level, and a re-order point based on different parameters. These parameters are defined for each product code in each unit independently, and the stock levels are constantly being re-evaluated. This is because the lead times vary even for similar product codes between the production units. Another reason is that the demand can vary between regions, which affect the stock level in the CS. Refill order process is only concerning the motors that are stocked in the central stocks. The product responsibilities are divided among the production units, meaning each product code has a designated production unit responsible for the producing the products.

While the European production units are refilling mostly all the central stocks in Europe, the Asian model is different. The factory and central stock in China are located

in the same premises, and they are primarily providing products for the domestic markets. The refill order process in China is run by the PU organization. While there are two factories in India currently, only the other one of them is involved with the refill process. The Indian factory is feeding the European central stocks to fill in the gaps of European production unit's product offering. This process is actually different from the identified refill order process and is called the traded motor process. The basic idea of the traded motor business is that the product responsible PU is purchasing the motors from another PU instead of manufacturing them themselves (refill order process). Traded motor business is to be decreased in the future by adding these product codes to be manufactured within European PUs. The central stock in Singapore is currently operating on a hybrid model as the aluminium motors are handled by the PG logistics, and the refilling of cast iron products are processed by the central stock itself.

Stock management is an important aspect in the refill order process, as the basic concept requires the stock to provide enough products for the customers in agreed lead time. PG logistics function has identified three important aspects in the stock management:

1. Stock profiles (which motors and modification kits are selected as stock items)
2. Determining the stock target (how much is stocked)
3. Individual customer agreements of stock levels

All aspects are the same both in Europe and in Asia, while difference between the European and Asian models are how these variables are analyzed and determined, and how the refill order process itself works. For example, the stock parameters are determined and continuously reviewed by the PG logistics function in Europe, while in Asia these are analyzed in close collaboration of the SUs and the PUs. Stock products are products that have shown huge turnover, modifications that are usual, and individually agreed customer stocks. Reasons for excluding products from the stock profiles are, low turnover, non-frequent demand, short lead time and sometimes availability in other central stock (in the same region). The most common issues in stock management identified by the refill order process manager of the PG are:

- Stock outs
- Excess of stock
- Product code missing from the stock profile
- Poor availability of the products (low stock level & high demand)

Resolving these problems begins by checking the OMS parameters of the product code. If the parameters appear to be in order, the order schedules are checked. In delay cases, the PUs are expected to take actions to prevent similar delays from occurring again if possible. The common parameters used in OMS are, which motor/kit codes are stocked, where are these products needed the most, stock levels, and the lead time. The refill- and traded process parameters are evaluated within the PG Logistics function weekly basis, and when problems are occurring in the process. In China these parameters are evaluated on a monthly basis. Singapore central stock is not currently evaluating the stock levels and parameters regularly, and presently use values determined approximately 7 months ago.

The standard process for refill order process, which is illustrated in Figure 21, is the same model that is being used in Europe at the moment, and the target is to implement this model in the Asia as well. Traded motor business and PU managed refill process are left out as their importance is diminishing greatly in the future. The process map for the process was created with the help of the PG refill process manager to create an accurate representation of the current situation.

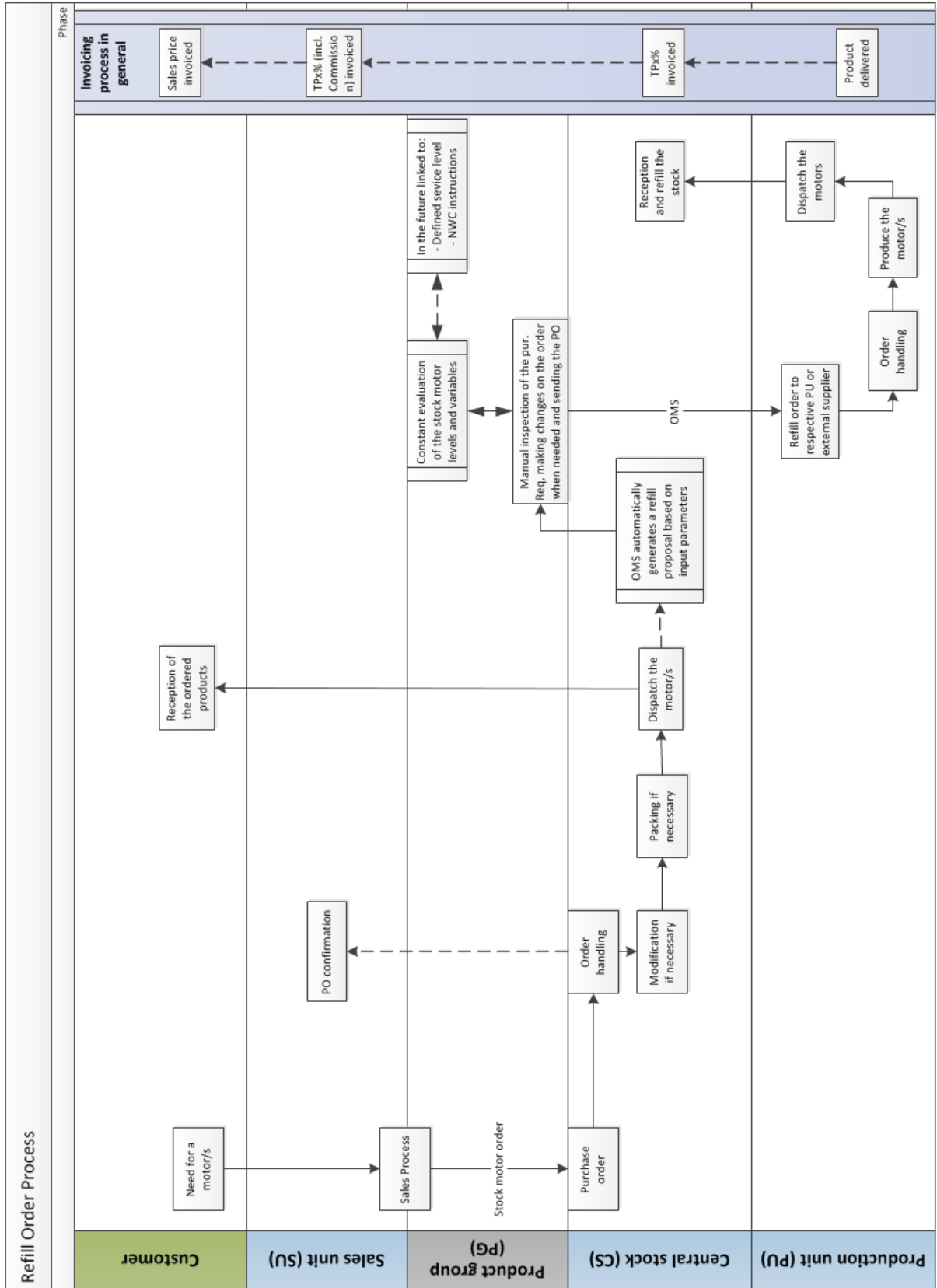


Figure 21. Standard model for the refill order process.

The general process flow before the actual refill order process is included in the standard model to demonstrate what is triggering the refill order process. Refill orders are triggered when the stock level in CS goes below the target safety stock and ROP targets. OMS automatically creates a purchase requisition for the respective products based on the input parameters set in the system. Each of these orders are manually inspected by the PG Logistics' refill order team. Once the orders have been inspected and modified (if necessary), they are sent to the responsible production unit via OMS. The purchase order goes through the order handling and production process and is shipped to the ordering CS. Evaluating the refill order parameters within PG Logistics is one of the key processes in refill order process. This is performed on weekly basis, and when problems emerge. The invoicing chain begins by PU invoicing a certain percentage of the transfer price (TP) from the central stock. Central stock invoices the same amount added with a pre-determined commission from SU (commission can be for example 4.2 % of the total invoice price). SU then invoices the customer for the agreed price.

The constant monitoring and altering of the refill parameters are to be linked to the defined service level and net working capital (NWC) targets in the near future. This is related to the target setting in the stock management (product parameter in OMS), where each product code is determined with a service level to be reached, often denoting the availability and lead time of the product for the customer. High service level means higher inventories, while lower service level allows lower inventories.

4.2.4 Order-to-delivery processes (D)

Order-to-delivery processes cover all the actions taken from the purchase order to providing the customer with the products they have ordered. Defining these processes is important for the company since there are significant number of different product types and agreements with individual customers that require flexibility from the order-to-delivery process. Therefore, the company has created a model specifying the responsibilities of each stakeholder in each process. The primary variables in the process are: where the order is placed (PU/CS), who is responsible for the dispatching the products to customer (PU/CS), and who is responsible for the invoicing to SU (PU/CS). For example the stock products are ordered straight from the central stock, where the CS has the responsibility of delivering as well as invoicing the products. The orders are placed in the OMS, where the information of the current status is transparent

for everyone with sufficient OMS rights. By default the information in OMS should be accurate, but there are still some situations where users forget to update the OMS data. This results into manual communication between the buyer and seller.

Currently the processes are well defined, but documentation and communication are still lacking. The purpose of this section in the handbook is to document the different order-to-delivery processes, identify and analyze the different variables in the process, and make a detailed presentation of the topic. There are three models used primarily for the process, but there are also three special cases that are seldom used. Analyzing the gap between current procedures and the documented standard procedure cannot be made in this section, as there is no gap between the model and the procedures in practice. However the basic procedure and the concept are presented in this section. The current processes are communicated using a three-letter notation, where each letter stands for responsible for certain task as seen in Figure 22.

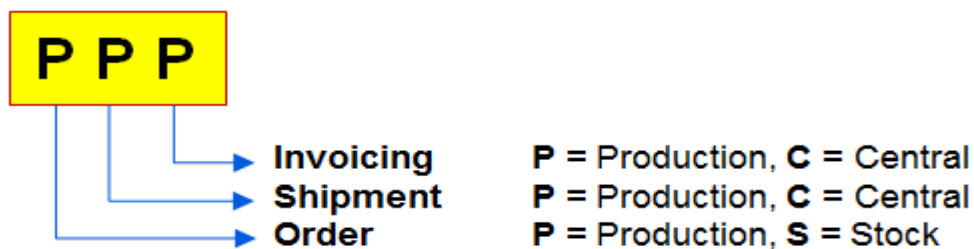


Figure 22. Communicating the order-to-delivery processes

The company is also presenting a new model called Stock on Demand (SoD). This model is not yet being used, but is to be implemented within the next few months in two of the PUs. The basic idea in SoD orders is that they behave like a standard stock product but do not have a stock target. When the customers place a purchase order on these products, the PU receives a traditional refill order. The OMS is able to identify these orders from the traditional stock orders, and the people handling the orders are able to pinpoint them. Identifying these orders in the order handling is important, as there are no safety stocks for these products, and they have fixed delivery lead times. Therefore there is no room for mistakes in the process, and these orders need to be handled quickly and sometimes even prioritized in the production. These products have ready-made bill of materials (BOM) and do not require further engineering. Through

this, it is possible to produce these products on a shorter lead time than the traditional production orders. From the customer's point of view the SoD orders are similar to traditional production orders.

The SoD model is targeted for basic products that have shown low or highly volatile demand in the past. There have been stock positions for each of these products in the central stocks, but with the SoD model these positions will be removed. This naturally reduces the total value of inventory. The drawback is that the customers have to settle for longer lead times than with the stocked products. There are several hundreds of product codes to be transferred under the SoD model and removing the stock on these products has a significant impact on the total stock value. Removing these products from the stock also removes the possibility of obsolete stock. The SoD is considered as a sub process for the SCC/SCP (stock motors) as the invoicing, shipment and ordering responsibilities are the same.

The general order-to-delivery process is illustrated in Figure 23 where all combinations of the current model can be seen. There are daily transportations from each PU to one or few central stocks because of the stock orders, and most the production orders (PXX) are transferred to the customer via central stock. Because of the high volumes, it becomes hard for the company to always use the most logical route to deliver individual orders. According to a member of the logistics team, this has led to situations where a customer located next to the PU has ordered products. These products are first produced in the PU and from there transferred into a CS in another country. From the CS, the customer finally received the goods, but it takes a week or two to move the goods around.

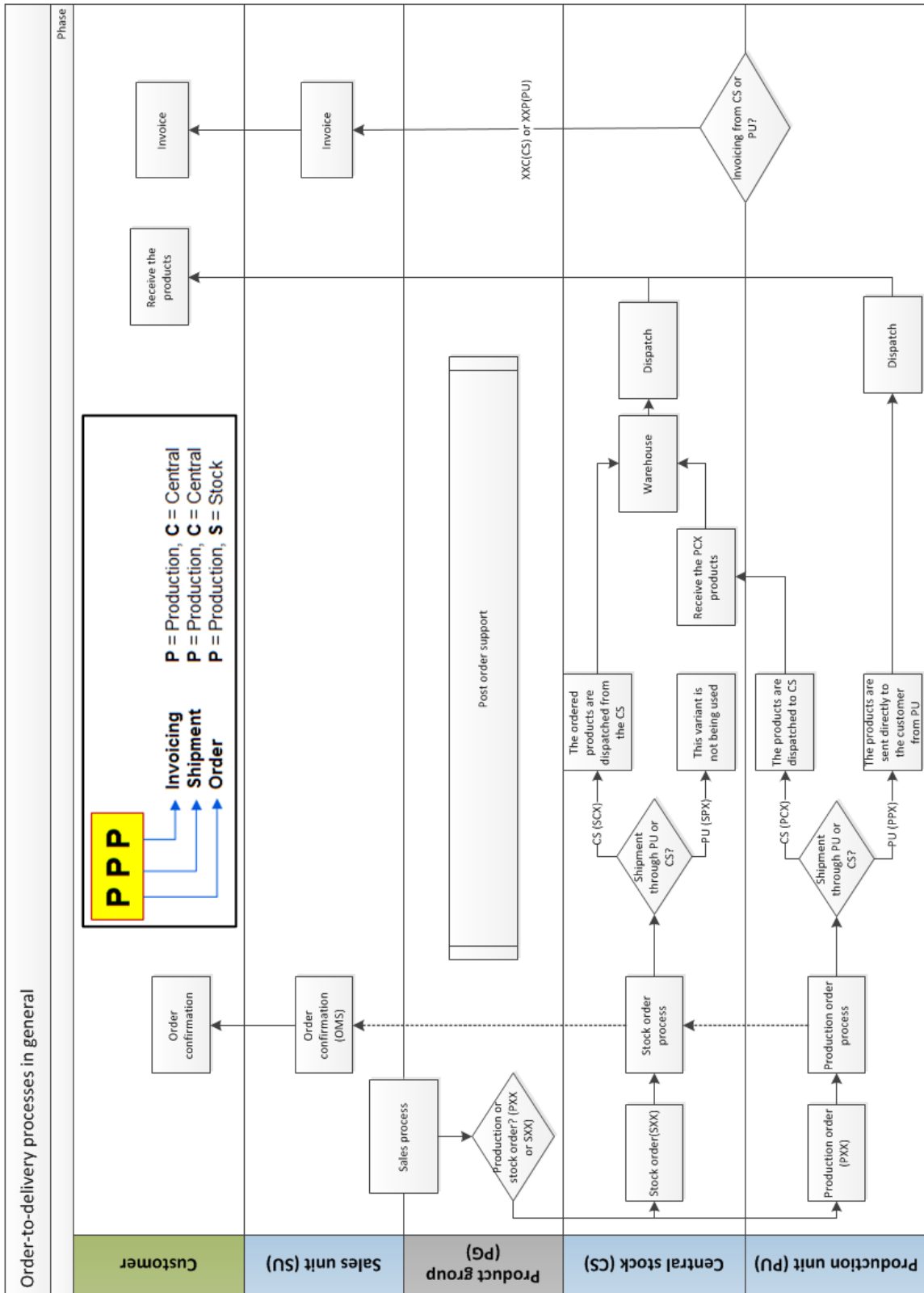


Figure 23. The general order-to-delivery process within the PG.

The most common models for delivery are SCC and PCC, which means most of the products are moved through the central stocks. The orders and information flow in general is handled in the OMS. Within the PUs/CSs the information is inputted in local ERP system, where the internal processes are carried out. There is an interface between the SAP and OMS to make the information flow automatic between these systems. The order delivery date is confirmed in the order handling function of the unit (part of the stock/production order process) to the SU, the responsible CS/PU is also liable to update changes in delivery date as soon as they become apparent. Therefore, anyone with the sufficient access rights to the systems can see when the order is supposed to be delivered. When the order is fulfilled, the information is relayed back to OMS and the SU is informed that the customer has received the product/s. The information flow is mostly the same inside the PG, as most of the units have OMS and local ERP in use. The only exception is that the Indian production units are not using OMS, so orders and order confirmations are placed through e-mails. The other communication related to these orders is handled through e-mail, phone calls and face-to-face meetings.

Post-order support is a continuous supportive process functioning from the moment the order is placed to the dispatching of the products. This function is responsible for handling customer requests, cancellations, and answering questions regarding the orders. The invoicing process is simple, depending of the product it is either PU or CS that is responsible for invoicing the SU a portion (for example 70 %) the product specific transfer prices. SU then invoices the end customer for the agreed price.

4.3 General information of the product group operations

General information regarding the PG order-to-delivery processes is stored in the handbook platform to complement the selected order-to-delivery processes. The selected content was decided to be the most important aspects of the overall PG operations to give the user a good overview of the PG. The assigned handbook content responsible people are in charge of upkeep of the content. This includes improving and updating the existing materials, and the creation of new material when necessary. The general information in handbook covers the operational models/strategies used within the PG, explains the management structure and operating system, explains the global footprint actions, gives an overview of the current production units and central stocks, and includes general and internal guidelines that are used. These topics are presented

and analyzed in this section of the study, and the reasoning behind selecting this information to the handbook. The general information within the handbook was divided in five different sections:

- Operational models/strategies
- Management structure
- Global footprint
- Units
- Guidelines

These topics are presented in the next chapters in general with the content that was created for the handbook. The importance and the effects of including these aspects are also considered in the next sections of the research.

4.3.1 Operational models/strategies

Operational strategies in the handbook explain the different manufacturing systems, production strategies, operational strategies, and the central stock concept used within the PG. This information is crucial in understanding the general operations in the case company and contains very basic information regarding these models or strategies. The aim of this section of the handbook is to harmonize the terminology used within the PG and to teach the employees how these topics are carried out and how they affect the local and global picture. These materials can also be used when informing the customer or other relevant stakeholders of our general operational models. However sharing of these documents should be highly controlled since they might include sensitive information regarding the PG operations. The content and the structure of the operational models and strategies can be seen from the Figure 24.

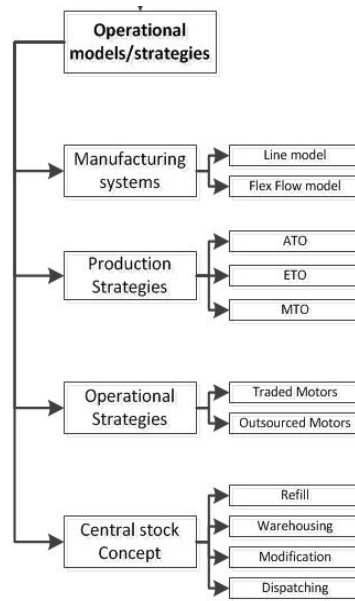


Figure 24. Operational models/strategies content and structure in the handbook for order-to-delivery processes.

Manufacturing systems presented here are the two different models that the production units are using for manufacturing. Line model is a classic model, where the products are assembled and manufactured in production lines. The basic idea is that the components are ready in stock when the production is started and the products are assembled in the production lines where the motor is transferred from work center to another in series. Flex flow model is a production system developed in another company that was taken over by the case company few years ago. This model was considered to be very efficient for the motor production but it is currently being used only in one of the new production line inside the case company, because of the relatively demanding setup process. It is possible the flex flow model is implemented in other PUs in the future. Flex flow model is based on highly mobile production using a conveyor belts throughout the production with sidetracks used for abnormalities in the production. Controlling is based on visual control as each production item is marked with a card indicating the basic information in text format and the expected starting date with the color of the card. The delayed orders can easily be pointed out by seeing the card color as each of the weekdays is marked with unique colors. Another distinctive trait of flex flow model is kitting. Kitting means that all the required components of the product are placed on a pallet before the assembly begins. These kits are then placed on a conveyor belt, where it moves until the product is finished. These two models are very different and

implementing the flex flow successfully often requires redesigning the of the entire factory layout. Line model production control is performed within the company ERP system, while flex flow system requires a unique production control systems. The handbook content for these topics is limited to defining the used terminology and to present the general idea of the both models. This section of the handbook also indicates, where each strategy is currently being used.

Assemble-to-order (ATO), engineer-to-order (ETO), and make-to-order (MTO) are the primarily used production strategies within the case company. These strategies are general knowledge even outside of this company but clear definitions for these strategies were needed. These strategies were defined with the terminology explained, and examples of practices inside the company were given. The variables that are affected by the selected strategy are also analyzed in the handbook. The target is that employees from various locations learn the difference between the strategies and understand how it affects the company operations.

The operational strategies include two different strategies to complement the product offering on different sales regions. The basic idea within the PG is that the production units could provide the goods demanded in their own region. Unfortunately, the case company is currently unable to do this and some of the products are either purchased from external suppliers (outsourced motors) or from another production unit within the PG (traded motors). The purpose of traded motor business from Asia to Europe is mainly to fulfill European demand for smaller stock motors. Outsourced motor business used both in Asia and Europe and the volumes in 2013 over 400.000 pieces with over 50 million USD annually, making it a significant business. The content for this section of the handbook contains the general information regarding the processes, process maps, defined terminology, list of product types traded and outsourced, and future outlook regarding these topics.

Central stock concept section covers the primary functions of a central stock: refill process, warehouse management process, modification process, and dispatching process. The central stock processes are especially unknown to the production unit employees and even for some of the PG employees. Information regarding the central stocks in general was hard to find within the existing intranet or databases. Storing CS related information in the handbook is a fine instrument to increase the central stock knowledge in the PG as the central stock concept includes all the relevant CS functions.

During this project it was impossible to formulate the central stock concept content due to the lack of managerial resources. The handbook site was created for this, but the responsibility for content was transferred to the PG manufacturing manager.

4.3.2 Management structure

The Management structure section of the handbook features described organizational structure, reporting structures, KPIs and the primarily used operational excellence (OPEX) tool called solver process. In addition, linking to an audit database is added with instructions on how to read the audit materials. The audit database access is restricted to only management level employees and includes information regarding the audits performed on the units within the PG. Currently, the PG management level structure and function are somewhat unknown in the PUs and CSs, at least on the operative level. In addition, the employees are unaware of all the KPIs measured within the PG since their daily focus is on the KPIs related to their own function's performance. Placing this information in the handbook provides the users a wider view of the process measuring in general and how the PG is organized. The solver process is a tool that is initiated when major problems are occurring with important customers. This process is managed by the sales units and requires active participation of every related unit and function. The persons involved are assigned certain targets to be achieved, and the progress is evaluated weekly until the performance reaches satisfactory levels.

4.3.3 Global footprint

Global footprint (glofo) actions are concerning global product allocation between the different units and ensuring the availability of product types in different regions. The most common global footprint projects are ramping up of new products, ramping down of older products, new product development projects and product transfers from one unit to another. According to the PG global footprint manager, there are on average 20 glofo projects on-going constantly within the PG. There is no information regarding the global footprint actions within the case company's internal systems and the handbook provides an easy way to communicate this function to the users. The global footprint manager also requested a workspace site inside the glofo section, where he and a limited number of other people could store and share files with common ownership. These workspaces are very useful in teamwork as the documents can be stored in one place, where every person with the right access rights can read and modify the file.

The content for global footprint SharePoint site consists of a general overview presentation of the global footprint with reporting structures and presenting the project model used globally within the case company called the “gate model”. There are different variations of the gate model within the company, but the basic concept is the same: divide the project in eight or nine sections where different predetermined goals are set. Once the goals of one gate are reached, the project team gathers up and decides whether the project is developing as agreed, whether to make adjustment or whether to dismiss the project. It is the same model that is used for this research project as well. Gate model site includes general document explaining every detail required for successful project execution with all the relevant documents one needs for projects. The general gate model plan can be seen in the Figure 12. The information in this section is of utmost importance as there are a lot of different projects ongoing and managing them efficiently is crucial. Standard project model forces the project manager to take all the necessary aspect into account when planning the project, as analyzing different aspects is a requirement built into the model. According to the PG manufacturing manager the project managers need to learn the gate model better to ensure better project execution. Placing detailed instructions along with the necessary templates will undoubtedly improve the project management within the PG. People can easily see what is expected from them and when, and they can find the information themselves in unclear cases.

4.3.4 Units

The product group in study consists of six production units and five central stocks in Europe and Asia. Current situation within the case company is that each unit is working as an individual organ of the company, which is managed by the PG level. In the beginning of this research project, it became apparent for the author that the employees working in the production units are quite ignorant of the global aspects of the firm as their daily routines often focuses on the local operations on their home unit. Presenting every unit in the handbook improves the sense of global presence of the employees and provides them basic information regarding each unit. This site also includes a calendar, where holiday season business hours and capacity is informed for the relevant stakeholders. This information is extremely important for the sales units so that they know what effect the vacation periods have on the production and how it affects the delivery time for the customer. The information regarding the units is available within the company, but it is only accessible to a small group of people. During this project we

did not receive a permission to share this information within the handbook. The content responsible person will add this information to the handbook when it is possible.

4.3.5 Guidelines

The guidelines section of the handbook consists of general and internal guidelines. The general guidelines comprises of guidelines that are available for everyone including the customers. An example of a general guideline is for example the return and cancellation policy of the PG. These general guidelines are compiled in the handbook to be easily accessible. The users are able to find these guidelines easily from the handbook without having to search the company intranet or other internal databases. These general guidelines are linked to the handbook from their original locations, so that the original file can be managed from its current location. This removes the need to upkeep same files simultaneously in each database. Internal guidelines are available for a limited number of relevant people and consist of guidelines of internal operations.

Internal guidelines consist of a document created to define the standard process for new product development projects and clearly assigned owners for different items of expenditure. Currently the costs are independently agreed within the projects between the production unit and research and development (R&D) department. The basic idea is that the production unit covers all the costs that bring them profit in the future, and the R&D covers the rest. The cost allocation is currently using a lot of resources in these projects and by creating this document the process can be streamlined. On average there are circa 20 new product development projects per annum and they require tremendous effort from units and different local and global functions.

These sites also include code keys to interpret product codes, material codes, serial numbers and different variant codes for the products. There is always a certain logic to which the codes are determined and these codes include a lot of data of the matter in hand. One can for example determine the size, material, type, auxiliaries, etc. by looking at the product code. This goes for other codes as well. Understanding the basic concept of the coding and variants the users can determine a lot of information without having to independently analyze the codes. This will improve the effectiveness of these employees and might even make communication between the people easier. For example saying “T mounting” means the same as “foot/flange is mounted and terminal box can be seen on left-hand side when looking from D-end of the product”.

Product codes are being updated in every price list. Therefore the handbook links the users to latest price list, where they can find the current prices and products. The variant codes are constantly being updated in a sales tool used by the company. This tool is open for all employees and the current variant codes are best checked there. The handbook contains a link to this tool with instructions how to search for the variant codes. Serial codes and material codes are not being automatically updated, and documents were created for this project indicating how these codes can be interpreted. The logic behind these two has been the same for at least eight years now and will not change any time soon based on current knowledge.

4.4 Analysis

The empiric data of this research project consists of documentation of the current procedures, created general global guidelines, the process of establishing the information system, and processing of the other relevant content for the system. The focus in this research is analyzing the current procedures to the created general guidelines for each selected order-to-delivery process using gap analysis. Gap analysis in this research project includes the following aspects:

- Gap description
- The effect on global operations of closing the gap
- Feasibility of closing the gap in global scale
- Risks of closing the gap
- Actions required for closing the gap

Gap description explains the gap between the current situations in each unit compared to the general global guideline. Analyzing of risks, feasibility, effects of the gaps, and identifying the required actions are done in collaboration with the researcher, PG operations manager, PG manufacturing manager, and PG operational excellence manager. Analyzing the gaps with this group of people improves the reliability of the analysis significantly, since these persons have spectacular overview of the global operations. The method for analyzing the acquired results follows the steps described below:

1. The researcher describes the current situation and identifies the gap.
2. The researcher analyzes the effects of the gaps.
3. The researcher analyzes the possible results achieved by closing the gaps.
4. The researcher proposes future suggestions to be improved in the processes.
5. The analysis is sent to the PG operations manager, PG manufacturing manager and the PG operational excellence manager, who evaluate the feasibility and risks of actions required for closing the gap on one to ten scale. These people can also leave comments in every field.
6. The researcher analyzes the numeric and verbal results from the PG managers and combines the results into final analysis.

The final numeric values are calculated from the arithmetic mean of the acquired results. Standard deviation (SD) for the results is also calculated to indicate how much the views of the different respondents differ. While there are only three respondents, the SD values have high volatility but it nevertheless indicates if the respondents share similar view of the topic. The researcher analyzes the open field comments individually with the help of the project team to summarize the different inputs. The gap analysis results are presented for each function independently in the next sections. The abbreviations used in the analysis are the following: FIMOT (Finland PU), SEMOT (Sweden PU), PLMOT (Poland PU), CNMOT (China PU), INMOT-F and -B (Both Indian PUs), CSN (Sweden CS), CSE (Germany CS), CSS (Spain CS), CSA (Singapore CS), and CSCNM (China CS).

4.4.1 Warranty handling process (A)

The identified gaps for the warranty handling in both PUs and CSs are clear and the effects can clearly be seen from the Figure 25. There were only two units without a noticeable gap in the processes. The case company is in the middle of a major project to implement BU level warranty handling processes. In practice this means the case company defines clear and harmonized processes for every unit within the respective BU. A new software platform will also be implemented with the new model, and the implementation is done as a sub-project for the BU warranty handling project (called DMHelp). The implementation of the new model and the system will close the gaps perceived in this study, but the final time schedule for the new model is still unknown.

The operational excellence manager of the PG refused to rate the feasibility and risk involved in closing the identified gap as presented in this research, since he thought that it is not practical to close the gaps right before the new model is being prepared. The PG manufacturing manager and PG operations manager ranked the feasibility of closing the gap very high, while the risk was ranked low. These results had low SD indicating these people agree on the feasibility and risks. The information value of the gap analysis for the warranty handling is to increase the knowledge of the current procedures, and the differences between the units as the company might not want to start changing the processes right before the new BU warranty handling is implemented. This analysis can also provide insight to what kind of benefits by implementing the BU warranty handling might provide.

Warranty handling	Current state	To-be process	No	Gap description	Gap effects	Effects of closing the gap	Future suggestions	Feasibility		Risk		
								Average	SD	Average	SD	
Production unit	FIMOT	Follows the general model	No	-	-	-	-	-	-	-	-	
	PLMOT	Follows the general model with an additional tool	Yes	They use CCRP as a WaHa tool in addition to the WaHa tool	CCR tool is also used in parallel with the waha db. Using CCRP as a parallel system means inputting the same case twice in systems.			10	0	3,5	2,121	
	SEMOT	Follows the general model	No	-	-	Global tool provides similar procedures, inputs and communication for every unit. The common process also brings on transparency making the performance measuring between units possible.			-	-	-	
	CNMOT	Follows the general model	Yes	- Cases handled through email, not in the WaHa tool - WaHa team part of SU organization, so the SUs don't need to approach the PUs with claims	- The cases are handled through email making the process lack transparency. - Less interfaces as SU owns the WaHa team -> probably more efficient	BU Warranty handling + DMhelp		9,5	0,707	1,5	0,707	
	INMOT-F	Follows the general model	Yes	Cases handled through email, not in the WaHa tool	The cases are handled through email making the process lack transparency			9,5	0,707	1,5	0,707	
	INMOT-B	Follows the general model	Yes	Cases handled through email, not in the WaHa tool	The cases are handled through email making the process lack transparency			9,5	0,707	1,5	0,707	
Central stock	CSN	No clear model, handled as individual cases	Yes	- There are no documented procedures within the CS warranty handling, but the procedures are somewhat similar between the central stocks nevertheless. - Some of the PU WaHa teams reported handling CS cases --> is there a need for CS waha teams?				10	0	2	0	
	CSE	No clear model, handled as individual cases	Yes		The CSs don't often even have a specified function for waha cases, but they are handled among other things as unique projects by one person.			10	0	2	0	
	CSS	No clear model, handled as individual cases	Yes			Global tool provides similar procedures, inputs and communication for every unit. The common process also brings on transparency making the performance measuring between units possible.	BU Warranty handling + DMhelp		10	0	2	0
	CSA	No clear model, handled as individual cases	Yes	- All CSs reported low number of waha cases annually					10	0	2	0
	CSCNM	The CS's WaHa cases are handled by the CNMOT's WaHa team	Common process / CS cases handled by PU WaHa teams	Yes		Reduces workload at CS. Most of the CSs reported low number of waha cases annually. Since there is no designated procedures these cases are often handled as individual projects. Now all the waha cases are centralized on one location in China.						
			Common process / CS cases handled by PU WaHa teams	Yes	If the aim is to move CS waha cases to PU waha teams, there is no gap.					10	0	2

Figure 25. Gap analysis for warranty handling.

The PG manufacturing manager stressed multiple times that using one tool or software throughout the whole company increases transparency and allows better follow-up of the overall process. According to him there are situations where the actual problems are not identified, because they are not recorded in the systems. These problems are only noticed, when the damage is already done and the customer is dissatisfied with the performance of the company. At this point the cases are often escalated to higher management. Acknowledging the problems earlier is crucial for the company as it can prevent customer dissatisfaction and reduce warranty costs significantly.

4.4.2 Post-order support (B)

The post-order teams are using a common tool called “Post-order database” globally, but the company is facing problems with capturing all the post-order cases in this systems. For example, it was estimated that the CNMOT captures only about 10 % of all the cases in the official database, while rest of the cases are handled through e-mails or phone calls. These problems are present in the other units as well, but in smaller scale. The problem with handling the cases outside the official system is that there is no trace of the case outside an individual employee’s e-mail. This causes problems especially when the company wants to evaluate or improve the current process, but there is not enough data to support the decision-making.

The three managers involved in this project rated the feasibility of closing the gap on average 8 with the SD of 2. This problem has already been identified in the company, but they have not been able to remove the problem, as the current system appears to be one of the key reasons for disregarding its use. The PG operational excellence manager denotes that creating the system is not the hardest part, but creating the discipline for it. The current database is hosted in Lotus notes based database but the company is planning to move all the current information system under Microsoft based platforms. Therefore the current systems in Lotus platform are to be changed in the future. The current target is to launch a new platform for post-order support handling in early 2015. The manufacturing manager of the PG argues if the current tool can even be used as a model for the new tool because of the current problems. The gap analysis for post-order support can be seen in the Figure 26.

	Current state		To-Be process		No		Gap description		Gap effects		Effects of closing the gap		Future suggestions		Feasibility		Risk	
Global post-order support	The post-order database is not used for all support requests	All the support requests are recorded in the post-order database	Yes	Many post order support requests are handled through phone, email or other "informal" means	- low transparency of the process - Case tied to one person if it is not handled through post-order database (PODB)	- Higher transparency allows better management decision and monitoring of the processes - During vacations and sick leaves other people can take over the case	A completely new tool for post-order handling that is implemented globally. (The company is moving away from the lotus notes based systems so the tool will inevitably be changed)	8	2	3	2,646							

Figure 26. Gap analysis for the global post-order support processes.

The managers rated the risk of closing the current gap relatively low (3), while the SD was 2.6, which is relatively high. One of the respondents rated the risk higher than the two others because he thought that the gap can only be closed after the implementation of the new system. The risk is high because the new system has to fulfil the requirements of all the units, which at the moment does not look too promising. If the new system is lacking on some aspect, the users might continue disregarding its use and the gap will continue to exist. The manufacturing manager stresses the usability of the system is a crucial aspect when it comes to the success of the system.

4.4.3 Refill order process (C)

The refill order process in Europe is currently harmonized and it is run by the global PG Logistics function. Therefore there is no gap between the current process and the to-be process. On the other hand, Asian PUs and CSs are using very distinct procedures to handle the process and they are different between the units. The case company aims to include every unit involved with the refilling process under the PG logistics function. Granting the control to a global function of the company allows better global optimization of the resources, harmonizes the processes, increases transparency, and makes the unit's performance more comparable to one another. It also reduces the possibility of units optimizing the process locally at the cost of global efficiency. The gap analysis can be seen from the Figure 27.

There was a gap identified only in two production units as the European units are following the standard model and INMOT-B is not involved in the refill order process. CNMOT is responsible for the control of the refill order process within China as the PU is mainly producing for the domestic markets. They have implemented a local model to carry out the process, but there is no transparency in the process outside the CNMOT and CSCNM. The respondents agree that closing the gap in CNMOT should be easily performed, they and rated the feasibility on average 9.33 with only ~0.6 SD. On the other hand they perceive the risks differently, but still relatively low with average score of ~2.7 and SD of ~2.1. The operational excellence manager commented that this change is really needed and the change is easy if implemented properly with enough time. Two of the respondents also stress the importance of regularly updated and comprehensive stock profile, good market and process understanding, and the tools used to run the process.

Refill order process	Current state	To-Be process	Gap description		Gap effects	Effects of closing the gap	Future suggestions	Feasibility		Risk		
			No	Yes				Average	SD	Average	SD	
Production unit	FIMOT	PG refilling	No									
	PLMOT	PG refilling	No									
	SEMOT	PG refilling	No									
	CNMOT	PU Refill	PG refilling	Yes	Close collaboration between CNMOT & CSCNM. Refill process managed by the PU.	<ul style="list-style-type: none"> - Locally managed, global aspect missing. - Different procedures between locations --> comparing the units hard/impossible - Procedures often unknown to people outside the local organization - Optimizing the operations locally, at the expense of global optimization? 	<ul style="list-style-type: none"> - Globally optimized assets - Units comparable -> basis for better management decisions - Common procedures within PG increase the transparency - Harmonized process 		9,333	0,577	2,667	2,082
	INMOT-F	Traded motor business to refill the european stocks	PG refilling	Yes	The orders are part of traded motor business (another PU responsible for ordering to CS. For example FIMOT ordering motors from INMOT-F to CSE)	<ul style="list-style-type: none"> - Tracing the open orders always requires personal communication (vs. checking the OMS) - PUs placing the orders --> they only see part of the whole process 	<ul style="list-style-type: none"> - Increased transparency in the orders and process - Centralized function for refilling (PG Logistics) -> better decision making - Harmonized process 		9,500	0,707	3,000	2,828
	INMOT-B	No refilling	No refilling	No								
	CSN	PG refilling	PG refilling	No								
	CSE	PG refilling	PG refilling	No								
	CSS	PG refilling	PG refilling	No								
	CSA	- Individual POs for CNMOT motors - stock transfers on aluminium motors from Europe (M2/M3 AA) - Target stocks determined with SAS RSM and PG Logistics (not regularly updated)	PG refilling	Yes	<ul style="list-style-type: none"> - Refilling to be managed by the PG Logistics team only partly as stock transfers (the low volume aluminium motors) - There is no regular upkeep for the refill parameters - The cast iron motors are purchased from CNMOT using normal POs 	<ul style="list-style-type: none"> - Very different procedures from the rest of the PG -> comparing to other units hard - Optimizing the operations locally, at the expense of global optimization? - Current stock targets from mid 2013 (no regular upkeep) and stock levels are probably not optimal because of this - Low transparency of the overall process 	<ul style="list-style-type: none"> - Harmonized process - Global optimization through PG - Regular upkeep for the stock levels - Increased transparency in the process 		7,667	3,215	3,000	1,732
CSCNM	PU refilling	PG refilling	Yes	Close collaboration between CNMOT & CSCNM. Refill process managed by the PU.	<ul style="list-style-type: none"> - Locally managed, global aspect missing. - Different procedures between locations --> comparing the units based on KPIs hard/impossible - Procedures often unknown to people outside the local organization - Optimizing the operations locally, at the expense of global optimization? 	<ul style="list-style-type: none"> - Globally optimized assets - Harmonized process - Increased transparency 		9,000	1,000	3,000	1,732	

Figure 27. Gap analysis for the global refill order process.

INMOT-F is involved in filling the stocks in Europe but the process is currently operated through the traded motor business model that was presented in the subsection 4.3.1. The case company is broadening the product offering in Europe so that there is no longer a need to purchase these motors from India, however this project is still not finalized and it is unclear whether or not the European units can become self-sufficient in these products. The operational excellence manager of the PG refused to rate the feasibility and risk involved in closing this gap because it will most likely be closed when the PLMOT starts manufacturing the previously traded products. The other two respondents rated feasibility on average 9.5 with ~ 0.7 SD having similar views for the feasibility. These managers rated the risk very differently and on average the risk was rated to 3 with a high SD of ~ 2.8 .

The refill order process in European central stocks is controlled by the PG logistics and there is no gap between the current process and the to-be processes. Both of the Asian central stocks on the other hand have different procedures and require a lot of attention before they are globally harmonized. CSA is filling the stocks using stock transfers from other central stocks and purchasing the products from CNMOT. PG logistics team has helped with defining the stock levels for CSA, but this is not a regular process and the CSA runs most of the operations itself. Seldom updated stock profiles may lead to excess or insufficient stock levels. The performance of the unit cannot be compared to the other central stocks, as the processes are different from the other units. This makes management decisions hard with the lack of comparable information. According to the respondents, it is crucial to understand the nature of regional demand and the business environment before closing the gap is possible. The PG logistics team is located in the Europe and implementing the common model might require their presence with the initial implementation process according to the PG operational excellence manager. Basically this means sending there an expatriate from the PG logistics team. Therefore, he estimates that the feasibility of closing the gap is significantly lower. The other respondents did not consider this a major problem leading to an average rating of 7.67 for feasibility with SD of ~ 3.2 . The risk for closing the gap was considered to be relatively low (3) with SD of ~ 1.73 .

Currently the refill order process for CSCNM is essentially the same process as described for the CNMOT. The operational excellence manager of the company stresses the importance of the functional stock profile and proper refilling tools, while everyone should also understand the general process. The managers rated the feasibility for

implementing the general model for CSCNM high on average (9) with a relatively low SD (1). The risk for the implementation was rated to 3 with the SD of ~1.73

4.4.4 Order-to-delivery processes (D)

The global order-to-delivery processes are mostly harmonized at the moment through the entire PG. The company has defined different models that are globally used and there are no significant differences between the units' processes. The company aims on lowering the capital tied on the stocks, and therefore it is implementing a new model called stock on demand (SoD) to help with this matter. The SoD model reduces the number of different product types stored in the CSs. These products are then produced within the PUs immediately after the order is placed, and with the existing BOMs the production process can be carried out faster than the traditional orders. Products with low annual volumes and highly volatile demand are included in the SoD. The expected effects of implementing SoD are: higher net working capital and eliminated chance of obsolete products in stock. The shortcoming of this model is a longer lead time for the customer, as the customer has to wait for the products to be assembled instead of being sent from the central stock.

The implementation of SoD has already begun for some products, but the amount of different products will be broadened in the future. The operational excellence manager of the PG commented that implementing this model is easy if there is the will, but he thinks some people might accept higher stocks in favor for lower lead time for the customer. He also noted that applying SoD in larger scale requires functional forecasting tools for the demand. The manufacturing manager stresses also the importance of the forecasting tools, but claims market know-how, while understanding of the demand fluctuations is also required. All three managers rated the feasibility high (9) with SD of 1. The implementation poses some challenges due to the matters mentioned earlier in this chapter and the risk was scored on average 4 with SD of 1. All three managers seem to agree the feasibility and risk involved in closing the gap. The manufacturing manager of the PG notes that the company might even be able to increase the number of SoD articles with a modular product structure that could potentially lead to lower lead times. The gap analysis can be seen from the Figure 28 below.

	Current state		To-Be process		Gap?		Gap description		Gap effects		Effects of closing the gap		Future suggestions		Feasibility		Risk	
																Average	SD	Average
Global Order-to-delivery process	Currently used models (SCC, PCC, PCC, etc)	Current models + Stock on demand	Yes	The new model to be globally implemented	- High inventories	<ul style="list-style-type: none"> - Lower NWC inventory - Removes the chance for obsolete products - Longer lead time for customer on SoD products 	.								9	1	4	1

Figure 28. The gap analysis for the global order-to-delivery processes.

5. DISCUSSION

The gap analysis in this project was performed with the help of three PG managers that evaluated the feasibility and risk of closing the perceived gap on each of the processes. The acquired results suggest that most of the proposed standardizations and harmonization actions are feasible to execute, as most of them were rated with high feasibility and relatively low risk factor. A combination of high feasibility and low risk is an ideal situation for the company to harmonize the global operations, but the high number of stakeholders in global processes often denotes enormous projects to be carried out requiring plenty of resources. Therefore, closing the identified gaps might not be possible immediately and simultaneously. The aim is to have the standard models as a guideline that can be utilized, when the company is initiating projects to improve the current operations. Another aspect of this project was to store information regarding the operations in general to increase the personal knowledge of the employees.

The research framework for this study was created based on the information acquired from the research literature and the requirements set for the project, because there was no literature available for similar cases. The model was tailored for this project and is most likely not usable as it is in other cases. However, it can be used as a reference for other cases within the other PGs of the case company or even external companies. The greatest challenge with this study is that it was only performed within one PG of one company. To further validate the framework used in this study, more case studies are required from different fields of operations. Comparing the results between different industry sectors might also provide valuable insight for standardization of global operations.

As this research project is ultimately documenting the current processes and procedures, creating the global guidelines, and establishing the handbook Sharepoint, the long-term results from these cannot be observed in this project. Measuring the expected results and outcomes might also be challenging as this project mainly increases knowledge within the company employees, and transparency of the global operations. On the other hand, the standardization degree can be seen as this project has documented the current procedure.

6. CONCLUSION

The case PG of this research has been undergoing a lot of structural changes within the last few years. The current enterprise structure is now few years old, but the global process knowledge mostly resides within the process masters and certain managers within this particular PG. The aim of this research was to solidify the information regarding the global order-to-delivery processes and topics closely related to it, to create better transparency of the global operations and to bring harmonization and standardization in the long run. This was achieved in this by documenting the current processes, harmonizing the strategies and terminologies, and by creating a harmonized global guideline for each of the documented process. These guidelines were created based on the current procedures when possible, while involving the process masters in the guideline creation process. As part of the implementation process, a web-based portal called handbook was created as the means to share the documented information. The handbook platform was implemented in the company's Sharepoint. The aim of the handbook was to increase the information and knowledge of the global operations within the PG, but the main contribution of this research project was the documentation of the current processes, creation of the global guidelines, and establishing process. The handbook contains other sections beside the order-to-delivery processes as well, and creating the basic structure and basic information regarding each topic was also part of the project.

The handbook structure and ownership was an important aspect of establishing process and future upkeep of the system. The general system structure was agreed with the project team based on the current needs of the company. The up keeping responsibilities had to be determined before opening the system for open use. Each of the sites was assigned an owner that is responsible for the content of the site, and updating it when necessary. The PG operational excellence manager was appointed as the handbook owner to arrange regular meetings with the upkeep responsible persons to evaluate the need for updating the existing documents or adding new content. Standard process documentation templates were also created or selected from the company achieves to harmonize the documentation used in the handbook.

The research project began by learning the general global processes within the PG, and by planning the whole project based on the case company's own project model called the gate model. The model divides the project in nine gates that each require certain

agreed actions to be taken before the project may continue. Once the targets for each gate were reached, a meeting with the project team was arranged to evaluate the current situation of the project and to decide how to proceed forwards. The first major target was to plan the system structure and content in great detail. It was considered an important part of the project, so that there would not be too much content, but everything the company urgently needed. Therefore the topics to be included were carefully discussed with the project team, and the level of detail determined. The research literature from different fields of studies provided the basic knowledge required for creating the framework for this study. The framework was divided in eight steps to include every major action performed in this project.

Establishing the information system was performed with the help of marketing and communication department of the case company. The handbook was implemented in a new Microsoft Sharepoint portal under the PG's own Sharepoint sites. The structure and the content for each of these sites were created as a result of this project. The content for the Sharepoint sites consisted primarily of process maps, process presentations explaining the most important aspects of the process, and other relevant documents. For example, the global order-to-delivery process sites included all of the above-mentioned file types, while some of the general/internal guidelines only consisted of one official document indicating the guidelines and rules. The document and process map creation was a time consuming process, since there were many people involved in the processes globally. Acquiring the process masters' knowledge to create the process maps and descriptions/documents involved contacting process master in each unit. Acquiring their knowledge often required phone calls and e-mail conversations. The global guidelines were created based on the documented current order-to-delivery processes, with the feedback from process owners in different units.

The last part of the research involved analyzing the gap between the current processes and the created standard operating procedures. Gap analysis was carried out by creating a table with the all the relevant information regarding the current process, standard process, effects of the current gap, and the estimated results achieved by closing the gap. The three PG managers involved in this process then evaluated the feasibility and risk involved in closing the perceived gaps on numeric scale from one to ten, and made comments when necessary. The results indicated that most of the identified gaps were feasible to implement, and the risks were rated relatively low in most cases. However, the PG managers perceived the risks differently in few cases that caused the SD of the

risk factors to climb. As a result of this analysis, the PG has more comprehensive view of the current global order-to-delivery processes, and global standard models for these processes to support the management decision in the future.

The objective of this research was to find out how can the case company's PG standardize and harmonize its operations. This included selecting the aspects to be standardized, finding out what kind of problems is the company facing with the standardization, what kind of results can be expected from standardization or harmonization actions, and what can be learned from the literature and this project. The selected approach was to use a Sharepoint portal to distribute the information regarding the chosen topics to the users. The Sharepoint consisted of all the relevant data required to understand each process or topic with harmonized terminology. The standardization was achieved by making global guidelines for the selected processes and creating harmonized definitions and explanations for other selected processes or models. Once the information is available for the end users from one controlled database, the content can be trusted and used to increase the information and knowledge of the PG operations. Global guidelines for the order-to-delivery processes communicate the management targets so that everyone is able to see what is the target process.

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