Improving Supply Chain Management with Advanced Planning and Scheduling

- Effects and possibilities with an international perspective

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Linköping Institute of Technology
Department of Management and Economics
Logistics Management
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Companies are more and more moving to low wage regions like Eastern Europe and Asia to stay competitive. Instead of lowering the cost of production, it has been argued that a company can stay competitive through making the use of the resources more efficient. In this study the effects a German resource saving concept, involving reorganization towards processes and an Advanced Planning and Scheduling (APS) module, has on Supply Chain Management (SCM) are investigated. In addition to this a comparison between German best-practice companies and Swedish companies has been done. This comparison was conducted in order to determine the changes needed to be made when taking this German concept to Swedish companies.

The results of this study indicate that through the German resource saving concept major improvements in delivery performance, responsiveness, supply chain costs, and asset management can be achieved. Further, this study has shown that there are very good possibilities for Swedish companies at reaching these improvements successfully. Barriers to a success in Sweden include a lack of managerial commitment and hierarchies as well as outsourced IT departments at Swedish companies. Recommendations to overcome these barriers consist of training key users more thoroughly and stressing the importance of committed managers.
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1 INTRODUCTION

The aim with the first chapter of this Master Thesis is to give the reader an understanding of the background to the problem and what the Master Thesis aims to answer.

1.1 BACKGROUND

In Sweden, a harsh business climate prevails and many companies are fighting for their survival. To stay competitive companies in the manufacturing industry decide to place production facilities in low wage regions like Eastern Europe and Asia (Kinnander, 2004). Some of the companies that have chosen to move some of their capacity abroad during the last years are Volvo, Ericsson, Electrolux, Alfa Laval, and Autoliv, the heart of Swedish industry.

Moving production to low wage regions is a part of globalization, which together with shorter product life cycles and focus on core competencies are identified as some of the biggest challenges for companies today (Christopher, 1998; Alvord III, 1999), and this indeed seems to be the case for Sweden. The reason for companies to move abroad is identified by Goldratt (1993) as he states that the ultimate goal for any organization is to make money. A company’s ability to make money is described by the often-used metric Return on Investment (ROI). Return on investment is described by the following formula:

\[
\text{ROI} = \frac{\text{Profit}}{\text{Capital employed}}
\]

Through expanding the formula, two other metrics emerge. The first one is interpreted as margin and the second one as capital turnover:

\[
\text{ROI} = \frac{\text{Profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Capital employed}}
\]

To increase ROI managers can either choose to increase the margin or the capital turnover, preferably both, and move to a higher ISO-curve (fig. 1.1).
Traditionally the focus has been on the margin (Christopher, 1998). Moving production and other functions is a way of cost cutting and therefore a way to increase profit\(^1\). Research shows however that a better way to improve ROI is to lower the capital employed by focusing on the efficient use of resources (Christopher, 1998; Kinnander, 2004). A management philosophy that promises lean processes, elimination of waste and minimization of inventory and other assets is Supply Chain Management (SCM).

The essence of SCM is that independent companies or parts of companies work together to control, manage, and improve the flow of materials as they share important information (Cooper & Ellram, 1993). This should all be directed towards meeting the demand of end customers better, faster and at less cost (Christopher, 1998). It is after all the end users that ultimately decide the success of the supply chain. This philosophy allows companies to minimize non-value adding processes, e.g. warehousing, quality control and safety stock, and therefore become more effective in their resource management. Confusing is therefore that even though the Supply Chain Management philosophy has been around for some time only a few companies, e.g. Xerox and Dell, have learnt how to master their supply chain through SCM (Christopher, 1998). These companies will lead the way and are referred to as the leading-edge companies (Christopher, 1998) or Supply Chain Excellence (SCX) (Stewart, 1995). Important characteristics of these best practice companies are that they emphasize planning, have a formalized logistical process and invest in state-of-the-art information technology (Christopher, 1998). They have understood that in order to manage complex supply chains effectively you need help from integrating software.

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\(^1\) Defined as Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA)
Today there are many different kinds of software on the market. Material Requirements Planning (MRP), Material Resource Planning (MRP II), and Enterprise Resource Planning (ERP) have been widely known, and used, for a long time. But as technology has progressed a new system has evolved, an add-on module for Advanced Planning and Scheduling, APS (Chambers, 1996). IT-structures involving an APS system can integrate suppliers and customers directly and becomes the heart of customer service and material planning (Langenwalter, 2000). Therefore, as corporate managers realize that an optimized production through the entire supply chain is the only way to cope with the problems of globalization, shorter product life cycles and focus on core competencies, the use of advanced planning and scheduling software will increase (Hammant, 1995; Alvord III, 1999).

In Germany, Wassermann AG provides a concept for improving productivity including an APS module and organizational changes. They want to know the effect their solution has on Supply Chain Management and how they can make Swedish companies reach these results. Wassermann AG has many successful implementations behind them, but what does it take to be successful in Sweden? Similarities on a macro level can easily be found between the two countries; the problems of globalization are discussed as fiercely in Germany as in Sweden, and companies like Siemens, Jungheinrich, and Volkswagen have located production facilities in low wage countries too. But what are the similarities and differences on a micro level and how should Wassermann adapt to these?

1.2 PURPOSE

The purpose of this master thesis is to investigate the effects a German concept, introducing a new organizational structure and an APS module, has on Supply Chain Management, what the prerequisites to reach best practice are, and how the concept needs to be changed when implementing it in Swedish companies.

1.3 DELIMITATIONS

This thesis is written on behalf of Wassermann AG (WAG) and for increasing their use of it they have chosen to narrow the research question with the following delimitations.

1.3.1 Sweden and Germany

Since WAG’s main market is the German market, the study is naturally directed towards Germany and German companies. As conclusions are going to be drawn about the Swedish market Swedish organizations will have to be studied too.
1.3.2 Midsized manufacturing industry

One of WAG’s main customer groups is midsized companies in the manufacturing industry and the study will therefore be directed towards this market segment. Midsized organizations are defined according to Wassermann AG as companies with a turnover between €10 and €100 million or with 50 to 1,500 employees.

1.3.3 SCM and Capital turnover

The thesis will focus on technical and organizational solutions within the field of Supply Chain Management for improvement of the capital turnover.
2 COMPANY AND MARKET DESCRIPTION

This section will give a brief presentation of Wassermann AG, its product portfolio and its work methods. The German and Swedish markets for APS software customers and providers are also described.

2.1 WASSERMANN AG

Wassermann AG (WAG) was established in Munich in 1983 by Otto Wassermann. After many years in the ERP business, he had realized the need of simulation-supported planning and scheduling for business processes. Today WAG is one of the leading providers of advanced planning and scheduling software on the German market. Wassermann AG has reached this position not only through a wide range of planning and scheduling software but also by being a consulting house for organizing Supply Chain Management structures. Their main focus is on midsized companies in make-to-order & small series production, pharmaceutical & process manufacturing, and in serial & variant production sectors. WAG employ consultants, IT-consultants, and developers. Wassermann AG, based in Munich, is the Consulting Services Division of Swisslog Holding, has about 70 employees and an annual turnover of €12 million.

Swisslog provides integrated logistics solutions to optimize production and distribution processes on a global market. They focus on building complex warehouses and distribution centers, providing hospitals with logistics solutions and software, and consulting, which also form their three business divisions; Warehouse & Distribution Solutions, Healthcare Solutions, and Consulting Services. Swisslog’s headquarter is located in Buchs/Aarau, Switzerland. Swisslog AG has approximately 2,000 employees in 23 countries worldwide with a turnover of about €360 million. (Swisslog, 2004)

2.2 WAG CONCEPT

The Wassermann concept consists of software and a new organizational structure. First will the different software be described and thereafter are the changes made to the organizational structure at their customers explained. This chapter also presents the internally defined success factors for the WAG projects.

2.2.1 Software

Wassermann AG has a portfolio of software for advanced planning and scheduling. Their four core products are waySCS, wayRTS, waySTS, and wayFOR. In addition to
these there are four additional modules; wayMES for efficient communication between different parts of the company as well as the supply chain through an Internet interface, wayVMI for realizing pull oriented delivery concepts, such as vendor managed inventory and continuous replenishment, wayINO for optimized inventory management, and wayKPI for a quick and detailed overview of the company’s and the supply chains’ performance. Fig. 2.1 below describes the positioning of the different modules within the company. For a more detailed description of the APS functionality see chapter 3.1.5 Advanced Planning and Scheduling.

**Fig. 2.1: Schematic use of the different software provided by Wassermann AG**

**waySCS**

The Supply Chain Simulation software for advanced planning and scheduling provides transparently displayed production plans through marrying project plans, bill of materials and routings (fig. 2.2).
In this structure the planned delivery date is shown which clearly displays if there is time enough for procurement and production as seen in fig. 2.3. Everything to the right of the vertical line is still doable while everything to the left is overdue.

However, the product might still be finished in time if the non-value adding time is eliminated. The non-value adding time is marked in the picture (fig. 2.3) by the outer segments of the horizontal bars. To squeeze the throughput time together enough capacities must be free. In fig. 2.4, the planned work on one capacity is presented.
Fig. 2.4: Example of how a specific capacity is used. The horizontal line symbolizes maximum workload.

Here it is easily detected that too much work is planned for this capacity with late deliveries as a result. As the software follows a human centered planning interface principle, the planner can identify this disproportion and take measures in time. This might be minimizing waiting time, rescheduling work or negotiate a new delivery date with the customer.

waySCS also enables the function Available to Promise (ATP) which allows the user to see how new orders will affect the present order. As the planning is run in batches a new simulation run of about 10 minutes must be conducted for every change.

wayRTS

The Real Time Simulation module realizes continuous planning and scheduling in highly volatile environments, as no simulation run has to be done when something has been changed. This tool allows organizations to control multiple production plants in real time as all planners are presented with the same information at the same time. Just like waySCS, wayRTS is used for a detailed planning level.

waySTS

With the Strategic Simulation, one may create and analyze different planning scenarios. Through this, potential under and over-capacities are automatically identified and gives the company a chance to move production to alternative location for better use of resources.
wayFOR
The forecasting software simplifies the demand and distribution planning in organizations. Seasonal variations are taken into account through an analysis of historical data. This simplifies the planning of procurement, production, and distribution.

2.2.2 Organizational changes
As said before, the WAG concept consists of not only software but also organizational changes. A new function for harmonization and synchronization of the performance process in the company is, according to Managing Consultant Axel Flechtenmacher, always formed. This is often called Process Management or Supply Chain Management. Its main responsibility is, according to Flechtenmacher, to ensure the delivery reliability through eliminating bottlenecks, backlogs, and waste. This is done by coordinating the other functions in the company, according to predefined frames of action. It is very important that the Process manager is given mandate to directly contact the problematic process driver. Flechtenmacher means that in this way a quick solution to the problem can be found without having to go through the usual bureaucratic hierarchy. By instituting this new function all activities surrounding production planning, manufacturing control and material planning are concentrated here. One important characteristic that should be reached is single responsibility, not just in planning and scheduling but in all functions. Depending on the existing structure in the organization, the new structure may involve letting go, redeployment, or hiring new employees.

2.2.3 Project process
Every project starts, according to Flechtenmacher, with the customer choosing software to implement. After that, the consultants and IT-consultants implement it through the model shown in fig 2.5.
Strategic Roadmap

Flechtenmacher says that the first and very important step is to define the project roadmap. This includes calibration of the objectives and expectations as well as defining the critical success factors for the realization. Flechtenmacher continues with stating that this should be mapped against the current processes. If not properly defined and agreed on, the customer and consulting firm will have different views on the end result with low customer satisfaction as a possible result. In addition to this, KPIs have to be defined for measuring the goal fulfillment effectively.

Modeling

Through workshops with the upper management the new organizational structure, as described in chapter 2.2.2 is formed. When defining the processes, procedures, and execution of the new functional structure it is, according to Flechtenmacher, important that it is done in close connection with the employees as without their support the new organization can easily fall back into the old one. The adapted responsibilities and assignments of the different functions in the company have to be defined as well.

Implementation phase

In the last step, Flechtenmacher says that the focus is on implementation and operation of the Advanced Planning and Scheduling software. By this time, the interface between the APS module and the ERP system is successfully programmed and the education of the employees, the so-called harmonizers, with authentic data can be started. The harmonizer is the former production planner with the task to level out production with the help of the way-software. This education will not only be in the
software and how the software can support the daily activities but also in the new processes the organization will work after. The backlog will be eliminated and after this, according to Flechtenmacher, the customer can go live with planning material, machines, and employees. After reaching backlog freedom, the consulting firm supports through coaching and discusses additional installations of improvement programs. The entire process can take anywhere from 3 months to a year. In most cases, it is finished within 6-8 months.

2.2.4 Success factors
Through interviews with the three Managing Consultants at WAG; Mayk Beregsasi, Alexander Fink and Axel Flechtenmacher some important success factors in an APS implementation project were revealed. All three stressed the following six fields.

**IT Experience and Knowledge**
A high IT experience and knowledge at the customer will lower the resistance and anxiety towards working with the new software and speed up the implementation as the internal IT department can contribute with important skills to e.g. the common interface.

**Commitment to Change**
The upper management must take and active role in the project and successfully communicate the need for change to the entire company. In order for the project team to propel this attitude towards change in the company the best employees should be selected as project leader and project team. Important to remember is that only by securing the new philosophy at the upper management, the employees will be able to adopt a process structure within the organization fully.

**Education**
A high educational level of both management and employees leads to that high-quality feedback will come from the customer’s side. The active involvement of the project team setting up the frames for the new organization will lead to a much higher success rate as the goals of the project are better understood and better realized.

**Culture**
Company cultures with efficient and structured work methods, open lines of communication, and hierarchical organization are more likely to be successful. Efficient and structured work methods and openness will lead to a faster completion of the project. Speed is important if the implementation shall have the form of a project and not be regarded as “daily business” and to keep the project team motivated.
Problems will also surface faster and more often as information travels easier through the organization. One indicator for poor structure in the working methods is bad data quality. Without good working methods, operations are regularly entered and reported in a corrupt manner if reported at all, with bad data accuracy as a result.

**Industrial Complexity**

Firms within a complex industry have a greater need and understanding for planning and scheduling. These companies know that in order to handle multiple bill of materials and routings the work methods have to be structured and well planned. They will as a result have a lower resistance towards the necessary changes an APS implementation involves.

**Process Management**

As the APS concept of Wassermann is built around processes, the organization should change into a process structure for an optimal solution. If there is an understanding of a process structure present in the company, the employees will find their roles in the new process minded organization easier and without fear.

### 2.3 Competitors

When describing the Wassermann competitors in Germany and Sweden internal WAG information will be used as far as possible as this information is more detailed than what is acquirable externally. For Sweden, the in-house knowledge is limited why external sources have been used.

#### 2.3.1 Germany

According to Karsten Schaaf, the head of Marketing and Production Management, the largest competitor on the German market is SAP with a dominant position and an appreciated market share of 64%. Second to SAP is i2 Technology with about 9.5% while WAG has about 5.5% market share. The German market is approximated to €100 million.

Schaaf continues with stating that it is very difficult to estimate the true size of the market, as there are different kinds of players present. Companies like SAP have the full suite of software including ERP and APS systems while others are specialized on advanced planning and scheduling systems. Among the latter kind of companies, one can find Inform and Manugistics. Neither SAP nor Inform and Manugistics have focused on the organizational side of production optimization. WAG is fairly alone with a concept that combines software with extensive organizational and cultural
changes. The last group of companies identified on the market is pure consulting firms like Accenture that implement the software of others, mainly SAP.

As customers ask more and more for the organizational changes, the big players (SAP and i2) have started to bring the re-organizational skill in-house and thus getting closer to the WAG segment.

2.3.2 Sweden
The Swedish market does not have as many players as the German one. Once again, we find SAP as an important force together with Intentia that has the same product range as SAP. Intentia and SAP are also to be found among the largest ERP vendors in Sweden. In a study made by Olhager and Selldin (2003) top5 of the ERP vendors were identified as Intentia, SAP, IFS, Baan, and IBS.

As no information about the size of the Swedish APS market could be found it is be approximated through the total IT-budget. Here it can be noted that the Swedish IT budget for 2005 has increased with €600 million to approximately €10 billion (Exido, 2005). As the most important reason for investing in IT is said to be to increase efficiency and flexibility (Exido, 2005) one can assume that the APS share of this amount is considerate.

2.4 CUSTOMERS
As this study aims to answer questions of a logistical nature and not assess market potential only a brief description of the markets will be given. Focus will be on SCM, IT, and APS maturity in the companies.

2.4.1 Germany
According to Karsten Schaaf, the Head of Marketing and Production division at Wassermann AG, approximately 95% of the German companies are supported by an ERP system or a set of heterogeneous systems that have the function of an ERP system. The adoption of APS systems is lower as only about 20% of the companies have a true APS system.

2.4.2 Sweden
In the study made by Olhager and Selldin (2003) the ERP maturity in Swedish companies is found to be high. As many as 83.6% of the examined companies have implemented or are implementing an ERP system. They compare this result with a similar study made in the US where only 44.1% of the companies had an ERP system. Olhager and Selldin (2003) also found in the study that the main reasons for Swedish
companies to implement an ERP system are to replace legacy systems and to simplify and standardize systems. From an APS perspective, it is interesting to note that most of the companies with an ERP system are ready to implement extensions. Today only about 5% of the companies have an advanced planning and scheduling module but 45% are considering or have already chosen to implement an APS system.
3 FRAME OF REFERENCE

Relevant theory for this study will be presented here. This will include definitions and functionality descriptions of different IT systems and explanations to Supply Chain concepts and tools to evaluate it performance. Since this study has a logistical perspective, the literature will be directed towards this field.

3.1 SYSTEM LANDSCAPE

The present landscape of systems mainly consist of a mix of broad functions all integrated into one. However, it has not always been like this. In the beginning, when the computer found its way into production planning there was only Material Requirements Planning. (Langenwalter, 2000)

The most common systems and their history are shortly presented in order to give the reader the background to the APS system as well as this thesis.

3.1.1 Material Requirements Planning (MRP)

According to Brown et al. (1996), Material Requirements Planning (MRP) started out as a computerized approach for planning the material procurement and production. When exploding the demand for the end product through the Bill of Material (BOM) a discrete plan of collocation and production for the component items could be generated. The requirements for these parts are then compared with available inventory and open orders for the horizon of planning. (Brown et al., 1996)

As time went by, more functions were added to the software. This could be e.g. accounting, forecasting, master scheduling, or purchasing (Brown et al., 1996). With the added capacity from these new functions, it was realized that this improved system could offer an integrated approach to managing manufacturing resources (Klaus et al., 2000). This enhanced MRP was termed manufacturing resource planning.

3.1.2 Manufacturing Resource Planning (MRP II)

Where MRP only generated a schedule for procurement and production MRP II offers a wider set of tools to manage many of the functions of a manufacturing enterprise (Langenwalter, 2000). These extensions are, according to Langenwalter (2000) natural and often not very advanced. An important addition however was the closed loop that connected execution functions of production and purchasing to the overall plan (Langenwalter, 2000). Through this addition, the plans and inventories will always be kept valid even though something had been transported to or from the plant (Brown et
al., 1996). The resultant system offered an integrated approach to the management of all manufacturing resources (Brown et al., 1996).

### 3.1.3 Enterprise Resource Planning (ERP)

Enterprise Resource Planning (ERP) systems are a class of software for planning and managing not only manufacturing resources but, as the name reveals, all aspects of an enterprise (www.cscmp.org) including planning, manufacturing, sales, and marketing. Different writers like to lift up different functions but these in addition to financial, human resource, distribution, and R&D planning functions are most common. (See e.g. Jacobs & Whybark, 2000; Klaus et al., 2000; Langenwalter, 2000)

The ERP system is regarded as one of the most innovative IT developments of the 1990s and is one of the most widespread IT solutions of today (Al-Mashari, 2002). According to Jacobs and Whybark (2000), the great advantage over previous planning tools is that everything in the ERP system is integrated into one. There is no longer a need to transfer information from one system to another as all modules and functions share the same database. Another advantage is that everyone in the entire organization are presented with the same information at the same time through EDI and the Internet, and not only in one organization, even other supply chain partners can be tied into this network (Jacobs & Whybark, 2000).

Even though helpful for companies to integrate their business it is now discussed that ERP systems are not supporting the needs in a supply chain and were not even developed in the first hand with SCM in mind (Møller, 2005). In a study by Akkermans et al. (2003) European supply chain executives saw no future for ERP as it might eventually limit the progresses made in SCM. Al-Mashari (2002) points out that one of the major challenges of the ERP system is its flexibility. Al-Mashari (2002) says that organizations will always have to add parts to the systems through new needs or functions and this must be conducted as fast as possible. GartnerGroup that once coined the expression ERP has now identified the successor of it; Extended Enterprise Resource Planning (Møller, 2005).

### 3.1.4 Extended Enterprise Resource Planning (ERP II)

The Extended Enterprise Resource Planning (ERP II) system is based upon ERP (Møller, 2005). An important difference however is how the system is constructed. First, ERP II is completely Internet based (Ramco Systems Ltd, 2005; Møller, 2005). ERP systems enabled Internet communication but were stored on a server within the company while ERP II systems use the Internet as the platform for deployment. Second, the degree of componentization is much higher in ERP II (Møller, 2005). ERP
systems are divided into larger modules while ERP II is made up by many more small nodes (Møller, 2005). Through activating the required set of nodes, a more suitable software mix can be implemented, and through an easy activation of more or less nodes, the software will be as flexible as required by today’s fast-moving companies (Ramco Systems Ltd, 2005).

Nevertheless, there are still weaknesses of the ERP II system. Despite its name, its planning capabilities are not sufficient (Klaus et al., 2000). Even though great at integrating functions, the planning within ERP and ERP II systems is done without considering some important constraints (Alvord III, 1999). The actual availability of production resources like material, work force and machine hours are not taken into account, which according to Alvord III (1999) leads to overly optimistic forecasts. These problems can today be solved. Finite Capacity Planning (FCP) is the solution and is the basis for Advanced Planning and Scheduling (Alvord III, 1999).

3.1.5 Advanced Planning and Scheduling (APS)

The APS system is according to Sadowski (1998) a natural extension to the IT systems already in place. APS takes over the planning functions while the ERP system deals with the other functions it supports, e.g. sales, human resources, order transaction, etc. (Stadtler and Kilger, 2000). Alvord III (1999) is of the opinion that the APS system is an enormous breakthrough in the field of planning. The reason that this software has not been developed earlier is given by Stadtler and Kilger (2000) as it is not until now we have the computer technology to realize it.

Through FCP, companies have the possibility to assess the capabilities and constraints of all resources and materials when calculating the production plans (Alvord III, 1999; Quinn and Novels, 2001). According to both Alvord III (1999) and Quinn and Novels (2001), not only the constraints, but also the extraordinary but still often occurring events like machinery break down, late deliveries or express orders, will be calculable. Through the increased visibility, bottlenecks are more easily detected and remedied, capacities better utilized and future scenarios better generated and planned for (Stadtler and Kilger, 2000). Another highly appreciated function the APS system provides is, according to Stadtler and Kilger (2000), the ability to check whether any given customer order can be accepted or not. The APS system will therefore improve on-time delivery, flexibility and production costs.

3.2 IT Project Success Factors

Davenport (1998, p. 121) states that “if you’re not careful, the dream of information integration can turn into a nightmare” and that it therefore is important to be aware of
the possible risks and pitfalls. For ERP systems a lot of research has been conducted in order to describe the success factors in the implementation projects. As literature about APS implementation projects is missing the ERP theories will be used as guidance. As the previous chapter showed, there are both similarities and differences between ERP and APS system. Both are very advanced and complex systems that may involve organizational changes. A difference between an ERP and an APS implementation is that the implementation of an ERP system is a far greater challenge as all functions are affected.

In an empirical study of the success factors for ERP implementation Motwani et al. (2005) uses a model (fig. 3.1) adapted from Kettinger and Grover (1995).

![Theoretical framework for ERP Implementation Management](image)

Motwani et al. (2005) have verified through an extensive literature study that this model has a general acceptability within the business process change and enterprise resource planning research. They define the elements in the model as follows.
Learning Capacity

Learning is, according to Motwani et al. (2005) about being able to adapt to a new surrounding without falling behind in productivity and at the same time improving efficiencies. It is therefore important to have a human capital that can learn from others that have succeeded and through this experience being able to adapt to a new technology. The workforce consequently has to be able to search for information within the company, e.g. in other functional disciplines, as well as in external sources, e.g. through consultants or customers (Motwani et al., 2005). Motwani et al. (2005) divide this theme into five variables; adaptation, improved efficiency, declarative knowledge, external information use, and learning type. The ability to learn and adapt is something taught at the university why it is interesting to investigate educational levels in different countries. In Sweden, as many as 75% of today’s young adults are entering universities or similar institutions (www.oecd.org). The OECD mean is just above 50% while only 35% of the German young adults enter university (www.oecd.org). The percentage of the population that complete a university level degree does not show the same big difference, in Sweden 33% graduate and in Germany 19% (www.oecd.org).

Cultural Readiness

Motwani et al. (2005) say that cultural readiness is about the organizational culture making individual and organizational learning possible. Active leadership and so-called change agents are important drivers for learning, the change agents could for example be a Business Planning and Control System (BPCS) team (Motwani et al., 2005). Other essential factors for an organization that harbors learning and welcomes change are open communications, information sharing, and cross-functional training. Motwani et al. (2005) split this field into four different variables; change agents and leadership, risk aversion, open communication, and cross-training.

IT Leveragability and Knowledge Capability

According to Motwani et al. (2005), it is important that the IT department work as an enabler instead of a dominator. Research has shown that IT led projects more often fail to incorporate all aspects of the company, e.g. the business and human sides, and therefore fail more often (Motwani et al., 2005). Motwani et al. (2005) also stresses that even though the projects should not be led by the IT department, they should be involved in the project as synergies between the business’s human and IT sides could be realized. This field is only divided into two variables; IT role and use of communication technology (Motwani et al., 2005). Through the annual Global Information Technology Report compiled by World Economic Forum (www.weforum.org), different countries can be compared from an IT perspective. The
study assesses the role of Information and Computer Technologies (ICT) in 104 countries through the Networked Readiness Index (NRI) (www.weforum.org). According to the World Economic Forum (www.weforum.org) the NRI is composed of three different indexes:

- The environment for ICT offered by a given country or commodity
- The readiness of the community’s key stakeholders – individuals, businesses and governments
- The usage of ICT among these stakeholders

In this ranking Sweden performs very well and is through its 6th place one of the leading countries, while Germany, with their 14th place, perform slightly worse.

**Network Relationships**

It has been shown that the companies that promote cooperative, interpersonal and group behavior will in the end see the best result (Motwani et al., 2005). The importance of communication and an open information policy are also stressed by Al-Mashari et al. (2003). Networked relationships are not only regarding the own organization but also the position taken towards external suppliers, like the consulting firm (Motwani et al., 2005). Motwani et al. (2005) refer to their study when they say that it is better to work closely with the system vendor than with other consultants in order to achieve strong inter-organizational linkages. The two variables for network relationships are inter-organizational linkages and cross-functional cooperation (Motwani et al., 2005).

**Change Management**

The importance of that the management is ready to change is stressed by both Motwani et al. (2005) and Al-Mashari et al. (2003) and must not be underestimated. Motwani et al. (2005, p. 538) continues by stating, “…organizations, groups, or individuals resist changes that they perceive threaten them” why it is important for the top management to deal with this problem early. Other important areas Motwani et al. (2005) emphasize are the management’s participation in the change process, continuous improvement, formal change process, and the top management’s vision for change. A committed top management is also stressed by Umble et al. (2003) and Al-Mashari (2002). Umble et al. (2003) and Al-Mashari (2002) also underline that the management must not only be committed to change but also ready appoint a great project leader and project team. This is important as these people are entrusted with critical decision-making responsibility (Umble et al., 2003). The four variables for
change are according to Motwani et al. (2005) pattern of change, management readiness for change, scope of change and management of change.

**Process Management**

As the ERP system is designed after processes it is important that the business is aligned after these processes (Al-Mashari et al., 2003), and for a higher use of the business processes they should be supported by the right methodological approaches, measurements, tools and techniques, and documents (Motwani, 2005). Among the different process measurements, Motwani et al. (2005) mention process metrics, process information capture, improvement feedback loop, and process audit. The tools and techniques for managing processes are quality control tools, data flow diagrams, CASE tools\(^2\), and simulation, while documentation consists of process flow chart analysis, fishbone and root cause analysis, amongst others (Motwani et al., 2005). The following three variables describe this field; process measurement, tools and techniques, and team basis.

In addition to the above mentioned success factors Umble et al. (2003) points out some other factors that are critical for successful ERP implementation. According to them, key people in the organization must have a clear understanding of the strategic goals and how the system will support these goals. Umble et al. (2003) also stress the importance of data accuracy as this reflects how good the working methods are. If wrong data is entered in one end it might spread through all parts of the system which could be devastating (Umble et al., 2003).

### 3.3 Organization

Organizations in the sense of structured groups and not companies have not been studied by researchers for very long and therefore the present material is limited and many terms lack definitions (Bakka et al., 1999). According to Bakka et al. (1999) the researched organizations are characterized by a complexity that needs to be coordinated and have structured goals. Defining organizations according to their goals have, despite this, been disputed by different researchers as the goals of the organizations rarely are something that connects the different members of the organization and that the goal of the organizations cannot be decided by neither summing up the goals of its members nor taking the goals of the upper management (Bakka et al., 1999).

\(^2\) Computer Aided Software Engineering tools
The view of many parties in the organization with conflicting goals is presented in the coalition model in fig. 3.2 (Bakka et al., 1999).

![Coalition Model](image)

These are the parties that have interest in the organization and their power is different in different organizations (Bakka et al., 1999). The areas of organization that is normally studied are according to Bakka et al. (1999) structures, processes, and culture.

### 3.3.1 Structures

A structured view on organizations is according to Bakka et al. (1999) expressed through that leadership is placed on fixed positions in the organization and is described with titles. Leadership is therefore something you have and are. Through this kind of leaders the bureaucracy is built up. The bureaucracy is the fundamental form of organizations in industrialized countries (Bakka et al., 1999). Components of bureaucracy are defined as division of work and specialization, hierarchical structure, general rules and career possibilities (Bakka et al., 1999).

### 3.3.2 Culture

The cooperation between leader and employee follows the cultural patterns of the country where the organization is present. This is, according to Bakka et al. (1999),
only one expression of organizational culture, others are buildings, product design, color of the car park, ways to cooperate and solve problems and conflicts. The organizational culture is the standards and values in the company.

Bakka et al. (1999) means that the major part of the factors that influence culture is hidden to the uninitiated observer and draws parallels to an iceberg, where the major part is below water and therefore invisible. The visible parts consist of goals and visions, technologies used, organizational structure, financial resources, etc. while the hidden parts may be attitudes, values, feelings, social connections, and group standards (Bakka et al., 1999). However, the culture is not only affected by the company specific factors, according to Bakka et al. (1999), the national cultural differences are significant.

In 1980 the Dutch sociologist Geert Hofstede conducted a cross-cultural study of IBM employees in 40 different countries and could from this material classify national cultures from four different perspectives; Power Distance Index (PDI), Individualism (IDV), Masculinity (MAS) and Uncertainty Avoidance Index (UAI) (Bakka et al., 1999). Hofstede defines these four dimensions as described below:

**Power Distance Index**
This index relates to the equality, or inequality, between the people in the studied culture. A high PDI shows that there are great inequalities in money and power in this country and that the society does not support citizens of a lower class to rise to a higher class. A lower PDI indicates that the country emphasizes equality and the same right for all. (www.geert-hofstede.com)

**Individualism**
The individuality dimension describes if the culture focuses on the individual or the group. A high score indicates that the members of this culture rather form many loose relationships whereas people living in a culture with a low individualism index are more collectivistic and tend to tie close bound with each other and care more about the family. (www.geert-hofstede.com)

**Masculinity**
The masculinity index depicts if the culture protects the traditional male dominated society. A high MAS ranking indicates that these cultures are highly differentiated after the gender of the members in the culture. Cultures with low masculinity lean towards an equal society where men and women are treated equally in all situations. (www.geert-hofstede.com)
Uncertainty Avoidance Index

The uncertainty avoidance index reflects if the society is open or closed towards change. A high UAI score implies that the country tries to avoid uncertainty and ambiguity. This is supported through rules, laws, regulations, and controls. A low uncertainty avoidance index indicates that the culture is more open to change, and is therefore not that rule-oriented. These cultures accept changes faster and take on more risks. (www.geert-hofstede.com)

The values for Sweden and Germany are according to the Hofstede ranking as described in fig 3.3 (www.geert-hofstede.com).

![Figure 3.3: The German and Swedish culture scores (www.geert-hofstede.com)](image)

Different Management Cultures

Birkinshaw (2002) comments on the differences between, amongst others, the Swedish and German management cultures. According to Birkinshaw (2002), the Swedish culture of low power distance and uncertainty avoidance leads to a more open way to work and that managers and employees are more equal than in Germany, as hierarchies are not strived for. This equality let the employees come with ideas and to criticize the ideas of the boss (Birkinshaw, 2002). That Swedish employees are more open to take on responsibility and to work without supervision is according to Birkinshaw (2002) explained by the high uncertainty tolerance which also makes Swedes less resistant to change and more able to adapt to new surroundings and requirements.
Birkinshaw (2002) continues by stating that the Swedish art of management consist of two basic parts; empowerment and coaching. Empowering is giving responsibility, sharing decision making and appreciating employee initiative, while coaching is building a team spirit, promoting co-operation, spreading information and taking an interest in the individual (Birkinshaw, 2002). Birkinshaw (2002) also points out that coaching is not about checking up on the employees or giving critique about his or her work as it sometimes is perceived as in the Anglo-American world. German managers are according to Birkinshaw (2002) not at all as their Swedish counterparts. Birkinshaw (2002) says that the German managers believe in frequent supervision and reviews and that they do not take as much interest for the individual as managers in Sweden do.

### 3.3.3 Processes

With a processual perspective on organizations, leadership is divided, according to Bakka et al. (1999), after what you do, and it might sometimes be hard to identify who the leader really is. Bakka et al. (1999) continues by stating that it is the activities, in other words the processes, that form the company and that structure and culture only are tools to understand the processes and that it therefore really is the interactions, often described as the flows of information that run through channels, networks or chains, that are important to study. Through structure and culture, we are only able to describe organizations and their processes as machines or organisms (Bakka et al., 1999). One philosophy including the entire company and all its processes is Supply Chain Management.

### 3.4 Supply Chain Management (SCM)

Supply Chain Management is a subject that has obtained much interest during the last decade. The Council of Supply Chain Management Professionals (CSCMP) provides us with an often-cited definition (Sandberg, 2005). CSCMP define Supply Chain Management as follows:

“Supply Chain Management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, Supply Chain Management integrates supply and demand management within and across companies. Supply Chain Management is an integrating function with primary responsibility for linking major business functions and business processes within and across companies into a cohesive and high-
performing business model. It includes all of the logistics management activities noted above, as well as manufacturing operations, and it drives coordination of processes and activities with and across marketing, sales, product design, and finance and information technology.” (www.cscmp.org)

This is also the view that Cooper and Ellram (1993) and Schary and Skjøtt-Larsen (2001) have of Supply Chain Management. Christopher (1998) adds the important aspects of customer and cost focus through stating that SCM aims at delivering ”... superior customer value at less cost to the supply chain as whole” (Christopher, 1998, p. 18). A supply chain is often depicted as shown in fig. 3.4.

For a better understanding of the supply chain Schary and Skjøtt-Larsen (2001) identifies three major components; activities, organizations and processes. These three perspectives are also the ones Sandberg (2005) uses with the difference that he calls activities functions. Sandberg (2005) on the one hand is of the opinion that the functional perspective usually deals with the problems of functional silos in supply chains and that a change towards processes is to prefer. The barriers connected to this change are dealt with in the organizational perspective, see fig. 3.5.

Schary and Skjøtt-Larsen (2001) on the other hand describe the functions as the foundations of the company. The different processes in the company are made up by different activities that the product has to flow through as it adds in value. The processes are therefore called the building blocks of the system. The organizational units in turn perform activities and are viewed upon as the reservoir of resources for
the supply chain. Together the actions, processes, and organizations make up the supply chain systems. An explanation to the different perspectives presented by Sandberg (2005) and Schary and Skjøtt-Larsen (2001) might be that Sandberg (2005) focuses on how to over-bridge the functional silos (fig. 3.6) whereas Schary and Skjøtt-Larsen (2001) describes the supply chain as if the functional silos already have been broken down and implemented in each process (fig. 3.7).

When viewing Supply Chain Management from a functional perspective the functional silos are often considered, and how the functional silos can be integrated into the processes (Sandberg, 2005). Sandberg (2005) refers to the view of Houlihan (1985) who says that the objectives of the functional silos constantly are in conflict with each other and that the task of SCM is to manage these conflicts without using inventory and excess capacity which is the normal solution. Sandberg (2005) continues by stating that literature from both the functional and processual perspective mean that an organization with processes as the dominant force (see fig. 3.7) is the solution.
Christopher (1998) agrees with this and says that as organizations compete through the output of their processes the focus must be on the processes. Other advantages of a process approach are that a better understanding for how the different activities performed in a supply chain are connected, coordination and integration are better supported and focus is put on the service to customers (Sandberg, 2005). As described in fig. 3.6, the organizational perspective focus on the problems and barriers connected to the restructuring towards a process organization. Sandberg (2005) refers to Mason-Jones and Towill (1999) when saying that one central problem related to SCM is that of information sharing as companies traditionally has viewed information as a source of power and not as something that should be shared with others.

Some of the advantages with SCM, e.g. better coordination and integration, have been addressed in the section above. Cooper and Ellram (1993) are of the opinion that there are three important reasons for companies to engage in Supply Chain Management; to reduce inventory holding costs, to increase customer service and to increase competitiveness of the supply chain. Gampenrieder (2004, p.5) mention these and some other fields in which improvement should occur through SCM:

- Improvement of delivery reliability
- Decreased throughput time
- Reduced capital lockup in inventory
- Lowered planning and controlling efforts
- Increased productivity
- Improved flexibility on changed market demands

Christopher (1998) continues with saying that in order to see these effects through SCM, companies must improve responsiveness, reliability, and relationships. Responsiveness is critical as product life cycles are shortened and customers are demanding more and more just-in-time (JIT) deliveries. In addition, reliability and relationships are important to improve because otherwise there is no possibility for JIT deliveries or integrated scheduling of production and deliveries to be realized. Stewart (1995) sees four categories where change has to be made in order for supply chain collaboration; the structure of material and data flows; policies, practices and procedures; systems for effective management of data across the supply chain; and organization regarding cross-functional integration. As we can see, these four categories coincide with the view Christopher (1998) has as they all stress the importance of relationships and increased responsiveness and reliability through these relationships.
However, not all companies can see major improvements through SCM. According to Christopher (1998), three issues must be considered by companies that want to master SCM. First, the supply chain partners must develop a joint strategy for the goals of the supply chain. In a successful supply chain, all must strive towards the same goals and cannot suboptimize through rating their own internal goals higher than the common ones. The companies must also see to that there is a win-win culture in the supply chain. It might be hard letting go of the old buyer/suppliers relationships characterized by rivalry and putting pressure on each other that have pervaded historical business connections. In order to win as a supply chain the different entities must understand that they are working together. Finally yet importantly, there must be an open line of communication. Through letting the customer demand shine through to the other end of the chain all parties can react faster and therefore meet this demand more rapidly. Stewart (1995) stresses four other key areas where companies that want to master SCM have to focus:

- Delivery performance
- Flexibility and responsiveness
- Logistics costs
- Asset management

Stewart (1995) also observes some characteristics of best-in-class companies. These are e.g. that the management are able to make fast and consistent fact-based decisions and that cross-functional teams are integrated into the organizational structure and have clearly defined goals, roles and responsibilities. Christopher (1998) uses a study made by the Council of Logistics Management when defining the characteristics for best practice organization. He concludes that the most essential features of these companies are that they:

- Exhibit an overriding commitment to customers
- Emphasize planning
- Encompass a significant span of functional control
- Commit to external alliances with service suppliers
- Have a highly-formalized logistical process
- Place a premium on operational flexibility
- Employ comprehensive performance measurement
- Invest in state-of-the-art information technology
3.5 EVALUATING SUPPLY CHAINS

There is no longer any doubt about that getting the supply chain to work properly is most critical for companies. According to Jacoby (2005), many organizations have realized this and are monitoring their supply structures and processes/functions. To assist companies when measuring the performance of their company, different metrics have been defined. In addition to this, the literature also suggests the use of a reference model for comparison between different lines of business.

3.5.1 KEY PERFORMANCE INDEX (KPI)

Today KPIs are used in most, if not all, business sectors to monitor the performance of everything from production and procurement to the management of entire supply chains. The strength of KPIs is that they give a picture of the company’s strengths, which must fully be understood if you want to compete effectively in the marketplace (Morphy, 1999). To do this you need to measure your performance and compare it to your competitors (Morphy, 1999). Stewart (1995) and Jacoby (2005) also stress the importance of comparing the performance to competitors and not only to goals and baselines. Bean and Geraghty (2003) stress another important issue, in order for the KPIs to be valid and effective companies must apply them in a consistent and comprehensive manner.

When reviewing the literature unison between most authors about which the relevant KPIs are is found. The grouping of the KPIs and some of the metrics themselves differ but most of them are always present. The three groups Service/Delivery Performance, Costs and Assets Management always seem to be present. Other groups also mentioned are Agility, Quality, and Responsiveness (see e.g. Stewart, 1995; Morphy, 1999; Jacoby, 2005).

Delivery Performance

The delivery performance is also called customer satisfaction (Stewart, 1995), service (Jacoby, 2005) and customer focused measures (Morphy, 1999). Stewart (1995) means that this key is the easiest controllable through Supply Chain Management and defines two metrics for measuring the performance in this field.

Delivery-to-request date is the percentage of orders that are delivered in time to the date the customer originally asked for.

Delivery-to-commit date is the percentage of orders that are delivered in time to the date promised in the contract.
Morphy (1999) chooses to highlight *on-time shipment* and *on-time delivery* as metrics for the customer satisfaction. These two metrics are similar to the two metrics Stewart (1995) defined but there is still room for misunderstandings. Stewart (1995) has noted the problem of definitions as nearly 30 per cent of the companies studied could not see the difference between delivery-to-request date and delivery-to-commit date. Other metrics important for measuring the delivery performance are *order fill* and *lead time* (Stewart, 1995) and *forecast accuracy* and *invoice accuracy* (Morphy, 1999).

To measure the perfect order frequency Christopher (1998) makes another addition; *on time, in full and error free* (OTIFEF). It is important to remember that this metric (OTIFEF) should be calculated as the product between the percentage of orders that are delivered on time, the percentage of orders that are delivered in full and the percentage of orders that are delivered without errors (Christopher, 1998).

**Responsiveness**

This field is also called flexibility (Stewart, 1995) and agility (Jacoby, 2005) and deals mainly with cycle times of the different processes (Stewart, 1995). Morphy (1999) on the one hand mentions *lost sales* and the *New-Product Introduction (NPI) cycle time* as metrics to monitor here. Stewart (1995) on the other hand says that *production flexibility*, *re-plan cycle* and the *cumulative source/make cycle time* are important metrics. The re-plan cycle and the cumulative source/make cycle time are by Stewart (1995) integrated into the supply chain response time, which is developed to describe the total cycle time of the supply chain and is defined as:

\[
\text{Supply chain response time} = \text{Days between forecast regenerations} + \text{Days to communicate new forecast to end-product plants} + \text{Days to communicate new forecast implications to internal feeder plants, if any} + \text{Average days required to source and make product (assuming zero starting inventory)} + \text{Average lead time in days required to fill a customer’s order}
\]

The production flexibility identified by Stewart (1995) is often measured through time to flex up 20 per cent to cover an unplanned increase in demand. Through having a short time to cover an increased demand the amount of lost sales, as Murphy (1999) identified, can be limited (Stewart, 1995).

**Logistics Cost**

Financially focused KPIs are according to Morphy (1999) for example *manufacturing cost*, *transportation cost*, and *inter- and intra-company costs*. Stewart (1995) chooses to pick out the *total logistics cost* as the one important cost. The total logistics cost is
constructed by four others costs; order management cost, material acquisition cost, inventory carrying cost and the supply chain finance, planning, and MIS cost, where the first three have a greater impact on the total logistics cost than the fourth.

Stewart (1995) continues with stating that from these four costs, the order management cost is the largest. Though both inventory carrying cost and material acquisition cost are growing because of shorter product life cycles and a global supplier base (Stewart, 1995).

Both Morphy (1999) and Stewart (1995) agree on that these costs need to be compared to something in order to be meaningful. Stewart (1995) proposes to compare them to the revenue while Morphy (1999) compares the manufacturing cost to the gross margin and the transportation cost to the turn-over.

**Asset management**

Some companies, according to Stewart (1995), increase performance in delivery and responsiveness through assets. For this, if no other reason, it is important to monitor how the supply chain manages its assets. The important metrics found in the literature are inventory turns and plant capacity utilization (Morphy, 1999) and cash-to-cash cycle (Stewart, 1995). According to Stewart (1995), the cash-to-cash cycle time is calculated as:

\[
\text{Cash-to-cash cycle time} = \frac{\text{Total inventory days-of-supply} + \text{Days-sales-outstanding} - \text{Average-payment-period to suppliers}}{\text{Average inventory} \times 365 = \text{Inventory days - of - supply}}
\]

Stewart (1995) also says that of these three terms the total inventory days-of-supply and the days-sales-outstanding are affecting the cash-to-cash cycle the most. Inventory turns, identified by Morphy (1999) is only the inverse of inventory days-of-supply, which is defined as:

\[
\frac{\text{Average inventory \times 365}}{\text{Cost of goods sold}} = \text{Inventory days - of - supply}
\]

The inventory days-of-supply, which of course should be as small as possible, estimates how many days of demand the average inventory, can cover (Stewart, 1995). Stewart (1995) also notes that the biggest leverage when trying to decrease the inventory days-of-supply can be found amongst the finished goods.
Days-sales-outstanding Stewart (1995) defines as

\[
\frac{\text{Total accounts receivable}}{\text{Average daily sales}} = \text{Days - sales - outstanding}
\]

where the total accounts receivable is the money owed to the company by its customers.

### 3.5.2 Supply Chain Operations Reference Model (SCOR)

SCOR is a process reference model that has been developed by the Supply-Chain Council (SCC) and is used to assess supply chain performance (Christopher, 1998). The SCOR model integrates, according to SCC (2005), the concepts of business process reengineering, benchmarking, and process measurements, and is meant to be used as a cross-industry standard for evaluating Supply Chain Management. The model is built around five central processes in the company. In the beginning there were the processes plan, source, make, and deliver (Huang et al., 2004) and later came return thereto (SCC, 2005). How a supply chain is connected through these five processes is described in fig. 3.8.

![SCOR Model Diagram](image)

**Fig. 3.8: The SCOR model (SCC, 2005, p. 9)**

To conduct the benchmarking in the SCOR model nine parameters, in five groups, are used (SCC, 2005). The first group is reliability and is defined by SCC (2005, p. 17) as “the ability to deliver the correct product, to the correct place, at the correct time, in the correct condition and packaging, in the correct quantity, with the correct documentation, to the correct customer”. The second block responsiveness is the speed with which customers are provided with their products (SCC, 2005). Flexibility is the third block and is defined as the ability a supply chain responds to changes in the marketplace. The fourth and the fifth block are costs and asset management are
respectively defined as the cost related to the running of the supply chain and how effective a supply chain is in managing its assets (SCC, 2005). These five blocks are almost the same as the four areas described in chapter 3.5.1 only with reliability in SCOR called delivery performance by the KPI authors and responsiveness and flexibility in SCOR is one area called only responsiveness in the KPI chapter.

The specific parameters, that also can be recognized from the previous chapter, are; perfect order fulfillment, order fulfillment cycle time, upside supply chain flexibility, upside supply chain adaptability, downside supply chain adaptability, Supply Chain Management cost, cost of goods sold, cash-to-cash cycle time, and return on supply chain fixed assets (SCC, 2005).
4 SPECIFICATION OF TASK

In this chapter, the purpose is broken down into more specific questions that this study aims to answer. This is done with help from the frame of reference.

As the specific research questions are derived from the purpose of the thesis it is here appropriate to repeat it:

The purpose of this master thesis is to investigate the effects a German concept, introducing a new organizational structure and an APS module, has on Supply Chain Management, what the prerequisites to reach best practice are, and how the concept needs to be changed when implementing it in Swedish companies.

This purpose can be broken down by focusing on three of the words in it; effects, prerequisites and change. For a structured overview of the problem, these three parts are used to answer the purpose. A first part therefore identifies the effects this concept has on Supply Chain Management, a second part identifying the prerequisites for reaching best practice through this concept, and a third part presenting the changes that need to be made to the concept in order to make it fit Swedish companies.

4.1 EFFECTS WAG CONCEPT HAS ON SCM

The effects companies may see on Supply Chain Management after implementing the Wassermann concept can be found through evaluating the performance in some vital areas. This is done by describing the pre- and post-WAG state through some carefully chosen KPIs.

When reviewing the supply chain literature, four fields can be identified that are important for supply chain managers; delivery performance, responsiveness, costs, and assets management. Stewart (1995) names these explicitly while Cooper & Ellram (1993), Christopher (1998) and Gampenrieder (2004) stress some of them. These four fields also correspond to the grouping found in the KPI literature. Each field will be further described with a description of the KPIs that will be used to evaluate the performance.

4.1.1 Delivery performance

The delivery performance deals with the reliability in deliveries. Delivery-to-request date and delivery-to-commitment date, fill rate and forecast and invoice accuracy are the interesting KPIs for measuring delivery performance. Delivery-to-commitment
date, fill rate and invoicing accuracy are covered through the On Time, In Full, Error Free (OTIFEF) metric which leads up to the following metric structure:

- Delivery-to-request date
- OTIFEF
- Forecast Accuracy

### 4.1.2 Responsiveness
Responsiveness has also been named flexibility and agility in the literature. A major influencing factor here is time, which is measured through different cycles, e.g. order cycle time, cash-to-cash cycle time, source/make cycle time, re-plan cycle time and order fulfillment lead time. Through the total supply chain response time the above-mentioned cycle times will be covered. Apart from the supply chain response time, it is interesting to know the new-product introduction cycle time as well as the time it takes for the company to flex production capacity up or down 20%.

- New-product introduction cycle time
- Supply chain response time
- Time to flex up or down 20%

### 4.1.3 Costs
As for responsiveness, there are many different metrics available for measuring the cost distribution over the company. A popular measurement of cost is the total logistics cost. For measuring the total logistics cost only order management cost, material acquisition cost and inventory carrying cost are interesting to further monitoring. This as supply chain finance, planning, and MIS cost only have a minor impact on the total logistics cost (Stewart, 1995). In addition to these, the manufacturing cost is of interest. This leaves us with these cost metrics:

- Order management cost
- Material acquisition cost
- Inventory carrying cost
- Manufacturing cost

### 4.1.4 Asset management
This last field is important to monitor, as it is possible to improve performance within delivery and flexibility by increasing the assets. For monitoring the management of assets, total inventory days-of-supplies and plant capacity utilization have been
suggested. The plant capacity utilization can be expressed through the degree of workload.

- Total inventory days-of-supply
- Degree of workload

Thus, the specified research question for this first part is how the identified metrics have been affected for best practice organizations when using the WAG concept.

4.2 PREREQUISITES FOR REACHING BEST PRACTICE

In chapters 2.2.4 and 3.2, different success factors for IT projects have been identified, with help from Motwani et al. (2005) and the WAG consultants amongst others. These factors have here been formed into a new framework for APS project success factors (fig. 4.1). In this section, German companies will be assessed after these factors to find the characteristic for reaching best practice Supply Chain Management.

Fig. 4.1: SCM Evaluation Tool for the APS Environment

IT Experience and Knowledge

The first area of excellence the companies should possess to successfully reach best practice SCM regards their IT state. Christopher (1998) mentions that leading edge organizations tend to invest in state-of-the-art software and the WAG consultants have noticed that a high IT experience and knowledge reduces the fear for a new system. They have also observed that when the company possesses a competent IT department the interface between the ERP software and APS module can be programmed faster and with a better result than when an external partner does the programming. Motwani
et al. (2005) also identifies that the IT knowledge is important and says that the IT department should function as a service provider during the change project and not be the leader as business focus might be lost.

**Change Management**

Both Motwani et al. (2005) and Al-Mashari et al. (2003) stress the importance of managing change. This can be done through having clearly defined goals, roles and responsibilities (Stewart, 1995). Umble et al. (2003) also focus on the management and state that the top management must be committed to change which is in line with what the WAG consultants have seen. The commitment to change from the upper management should be shown amongst other through appointing one of their best men for the position as project leader. This is important as during the project will fast and consistent decisions about critical matters be made.

**Education and Learning**

Motwani et al. (2005) identifies that organizations, groups or individuals resist changes when they feel threatened by them. A well-educated work force will less likely feel threatened by a new system and a new way to work and therefore be more open to this change. They will also realize the need for the change as the understanding of the strategic goals is higher. Highly educated employees can also contribute with more important input during the project as they have a higher tendency to study and learn from other successful cases.

**Cultural Readiness**

The importance of openness is stressed by Motwani et al. (2005), Al-Mashari et al. (2003) as well as the WAG consultants. It is also important that the company culture is pervaded by structure and a structured way to work. The culture should also be open and promote learning and cross-functional activities, not only within the own company but with external collaborates as well. The WAG consultants pointed out that data accuracy is a good measurement of work methods as poor work methods often are reflected through a bad data quality.

**Industrial Complexity**

Important when implementing an APS module is that the employees see a need for it. Therefore the WAG consultants have identified a strong correlation between seeing a need and being in a complex industry that emphasizes planning and scheduling.
Process Management
As the APS concept is built around processes it is very helpful when the company is aligned in processes and that the employees have an understanding for a process structure. Motwani et al. (2005) and Christopher (1998) stress the importance of supporting these processes with comprehensive measurements.

For the second research area, the specified questions regard the state in each relevant success factor of the SCM evaluation tool.

4.3 A Concept Fit for Swedish Companies
To determine whether the German concept is fit for Swedish companies the differences between German and Swedish companies need to be assessed. By comparing companies in the six areas; IT experience and knowledge, Change management, Education and learning, Cultural readiness, Industrial complexity, and Process management differences might be found. In chapter 4.2 specific research questions were asked in order to describe the characteristics of the German companies that successfully have reached best-practice SCM through the WAG concept. Through applying the same model on Swedish companies a comparable data set can be acquired.

These differences together with similarities found will then be mapped to the national differences between the two countries found in the theoretical review. This chapter therefore aims at discussing which theoretical differences there are between the nations and to which areas in the frame of reference these differences might correspond. Where no theoretical differences have been found the topics are discussed from the point of each country in order to try to identify any differences or similarities between Sweden and Germany.

IT Experience and Knowledge
As found in chapter 4.2, the interesting aspects of this field are how secure the employees are with new software and how high the IT knowledge is in the company. For assessment of national IT knowledge, the Global Information Technology Report and its Networked Readiness Index (NRI) have been used. Of 104 countries, Sweden has the 6th place while Germany only holds the 14th place (www.weforum.org).
Change Management

This field is very much about how committed the company and its upper management is to change. Clear goals, roles, and responsibility are also of importance. One factor for decreasing the resistance towards change is the Uncertainty Avoidance Index defined by Hofstede (Birkinshaw, 2002; www.geert-hofstede.com). In Sweden, the uncertainty avoidance is far lower than in Germany (www.geert-hofstede.com) which makes Swedes more able to adapt to a new environment (Birkinshaw, 2002).

Education and Learning

A well-educated people, in comparison to a not so well-educated people, do not feel threatened by change and do not resist it either. Education and the ability to learn are therefore important success factors. In a recent study made by the OECD (www.oecd.org) it is found that as many as 75% of the Swedish young adults are entering universities. In Germany, this quota is not larger than 35%.

Cultural Readiness

The culture regards openness as well as structure. This is addressed by the Power Distance Index also defined by Hofstede (www.geert-hofstede.com). In Sweden, the power distance index is a bit lower than in Germany and this leads according to Birkinshaw (2002) to a more open way to work in Sweden and more hierarchies in Germany.

Industrial Complexity

Literature comparing the industrial complexity or the need for an APS module in the two countries has not been found. What one can see is that Sweden and Germany are major trading partners and the goods that are shipped between the two countries are of a similar character (www.swedenabroad.com). For example, both countries have a well-developed automotive industry and other high-tech industries like telecommunications, appliances, and equipments (www.transnationale.org).

Process Management

The understanding for working in processes is important, as the work in processes will be increased after the implementation of the APS concept. No information about how well the understanding for process is spread in the two countries could be found. Working in processes is the trademark of Toyota as they have developed their Toyota Production System, which has spread to other companies. Though starting to catch on in other industries, working in processes is still something characteristic for the automotive industry. As said before both Sweden and Germany have a well-developed automotive industry. This cannot separate the two countries from each another.
Another indicator can be the penetration of ERP and APS software on the market as these software are directed towards processes. The world’s largest ERP and APS provider is German SAP (www.sap.com) and this might imply that the processual thinking is more spread in Germany than in Sweden.

The specified research questions in this last part aim at identifying the characteristics of Swedish companies in order to find the differences and similarities to German organizations. The questions also aim at mapping the differences and similarities to the theory to determine how the differences affect the WAG concept.
5 METHODOLOGY

This chapter aims to present the methodology used in this study. Theories about different models, approaches, and strategies are presented but focus will be on the course of action. The chapter is concluded by a critical discussion about the methods chosen.

5.1 COURSE OF ACTION

Since a project of this size almost never is linear but an iterative cycle the following steps have been done and redone with some overlap as the result, but in general, the course of action for this master thesis has been as described in fig. 5.1. The way the research in this study was conducted is explained below.

Fig. 5.1: Course of action from purpose to recommendations
5.1.1 Background and purpose
In the very beginning, when formulating the purpose of the study, internal interviews at WAG were conducted in order to get a clear picture of the problem. Relevant theory was also searched for and is presented to show the general and theoretical interest in the chosen topic. In this phase, the purpose was also defined together with the delimitations given by Wassermann AG.

5.1.2 Frame of reference
When reviewing different sources of reference it is important to examine the collected data critically, try to see behind the written words and discover why the article or book was written. This is particularly important when not using research papers, which has been the case in this study. The material gathered deals with different IT structures, Supply Chain Management and different ways to measure performance which also reflects the view of the thesis.

Information about different fields is gathered and presented. Not everything has been used directly in the study but still fills a purpose as it gives a broad picture of the problem and what information that could be used to solve the problem.

5.1.3 Model of analysis
The model of analysis consists of the purpose broken down in different parts that are further explained. Through breaking down the purpose and concretizing it, it is easier to answer it completely. The specified researched questions take their origin in the frame of reference. These questions to each area are then through the collection of empirical data answered in the analysis. As the purpose indicates a qualitative analysis, the research questions are formulated in a way so that they can be answered with this approach. Lekvall and Wahlbin (2001) list some typical traits of studies with a qualitative approach; selections often smaller than 20 cases, non-likelihood selections, and low structured interviews. As we will see, all of these characteristics are present in this study.

5.1.4 Methodology
In order to answer the research questions in a structured and correct fashion literature about different methods for conducting a study was studied. Lekvall and Wahlbin (2001) divides methodology into three dimensions; approach, character and type of data.

The first dimension, the approach, answers the question if the study is an in-depth or a broader investigation, and the writer can choose between a case, a cross sectional, and
a time series study (Lekvall and Wahlbin, 2001). In case studies, only a few samples are analyzed in detail. Distinguishing for case studies is that the writer has no greater intentions to draw any meaningful conclusions about how the cases relate to an underlying population. In cross sectional studies, on the other hand, several objects are examined with the purpose to reveal connections between larger groups or underlying populations (Lekvall and Wahlbin, 2001). The time series analysis deals with the development of different factors over time. One or a few variables are studies to declare if there is a pattern in their progress over time. To answer the purpose of this study a case study approach with multiple cases, both German and Swedish, is used. With this approach, a deeper understanding for the conditions in the companies in the two countries could be acquired and conclusions about how the concept should be changed could be drawn.

The second dimension relates to the character of the analysis. That is, will the study be qualitative or quantitative (Lekvall and Wahlbin, 2001). Qualitative studies are characterized, according to Lekvall and Wahlbin (2001), by that the writer uses a “non-countable” method when analyzing. According to Björklund and Paulsson (2003), qualitative studies can be used if you want to create a deeper understanding for a specific topic, occurrence, or situation. Quantitative studies are usually conducted with information that can be expressed in numbers and thereby analyzed with a mathematical-statistical method (Lekvall and Wahlbin, 2001). The character of a case study is often qualitative (Lekvall and Wahlbin, 2001) and so is the case in this study too.

The third, and last, dimension treats the type of data. Lekvall and Wahlbin (2001) differentiate between primary and secondary data. Secondary data is already collected and presented. Literature in the form of books and articles is an example of typical secondary data (Björklund and Paulsson, 2003). Primary data is collected directly from the original source, i.e. through interviews and observations (Björklund and Paulsson, 2003). In this study, only primary data has been collected and is presented in chapter 6 Empirical data.

5.1.5 Definition of cases
Through interviews with the three Managing Consultants at WAG, Mayk Beregsasi, Alexander Fink, and Axel Flechtenmacher, three different kinds of companies have been identified on the German market. These segments have also been confirmed through an at WAG internally conducted study (Lehner, 2005). There are the ones that do not work with SCM at all or just started, there are those who manage their supply chain satisfactorily and then there are those who are or are about the utilize SCM to its
fullest extent (Lehner, 2005). Lehner (2005) names these segments Supply Chain History (SCH), Supply Chain Management (SCM), and Supply Chain Excellence (SCX). Below follows a description of the different segments according to Lehner (2005).

**Supply Chain History**
Companies that are found in this category do not rank collaboration as important. They are thus seldom working with Supply Chain Management and do not see the use of sharing information with suppliers and customers. Therefore, it is no surprise that these companies do not have a supply chain strategy defined. Nor do they have a common set of KPIs for measuring the performance of inter- and intra-company activities. Most of the controlling made is done manually with the help of simple tools like MS Excel, as the software present does not have the necessary functionality. Planning and scheduling activities are time and resource consuming as low or no IT support is given, in addition to this, the quality of bill of materials, routing and project plans are low. (Lehner, 2005)

**Supply Chain Management**
Most of these companies think that Supply Chain Management is important and are regularly working with supplier and customer audit-days. They also consider a supply chain strategy as important but have not been able to realize this in the company since the employees have very different pictures of what supply chain collaboration means. For performance measurements intra-company KPIs are defined and often there is software support for following up performance. Still the companies feel that the software does not fill all their needs. (Lehner, 2005)

**Supply Chain Excellence**
The excellent companies value cooperation very high and have an intensive contact with their partners, often through Electronic Data Interchange (EDI) interfaces. These companies have no fear of sharing their data with other companies. They also have a defined supply chain strategy, which is shared by the entire company. Metrics for performance evaluation are inter- and intra-company defined and IT supported. In general, the IT systems have a very good functionality and most of these companies have support for advanced planning and scheduling. This leads to transparency, which together with backlog freedom are given highest priority in the field of planning. To accomplish this, these companies have a very good quality of project plans, bill of materials and routings. (Lehner, 2005)
Best-practice selection

As this study is aimed at assessing best practice SCM through the Wassermann concept the German companies chosen for a deep interview and analysis are all to be found in the segment with the SCX companies. The interviews of Swedish companies do not aim at describing the best practice in Sweden but to give a general picture of the characteristics of the manufacturing industry in Sweden. As no list of companies was available to this study, midsized companies from different parts of the manufacturing industry were approached. A high degree of the approached companies chose to participate why a good mix of companies was acquired. It is therefore obvious that both selections are non-likelihood selections.

5.1.6 Construction of interview guide

As primary data about the companies in Sweden and Germany was gathered through interviews, an interview guide, listing topics, which were to be covered during the interviews, was developed. The guide was composed to give the interviewer support during the interviews and to ensure that all companies were asked the same questions. It consists of two parts, one for determining the effects the WAG concept have on SCM and one for identifying the prerequisites for it in the companies. As the interviews aimed at getting a picture of the situation in the company relatively low-structured interviews were conducted to let the respondent tell freely what characterizes his or her company. According to Cassell and Symon (2004), this is most appropriate for a qualitative research interview. This was then complemented through some follow-up questions or probes as Cassell and Symon (2004) call them. These follow-up questions were to be asked if not addressed in the initial discussion about the current subject.

Cassell and Symon (2004) stress that the interview guide is not finished at the moment the first interview starts but often changes as more topics or probes emerges through interviews. Sometimes parts can be excluded this way too (Cassell & Symon, 2004). The interview guide used in this study did also change with new input from interviews. Some of the first interviews had to be complemented with questions about education and organization. In addition, the way to ask, formulate, and explain the questions did change as the interviewer learned what the interviewees responded better to.

As two groups of companies, German and Swedish, were interviewed, two interview guides was compiled. The one for the German companies may be found in Appendix A, and the one for the Swedish companies in Appendix B.
5.1.7 **Empirical data**

The empirical data was collected from the defined cases as primary data through semi-structured interviews and with help from the interview guide. A list of the interviewees is found in Appendix C. In total were 19 interviews with 18 persons at 15 companies, 10 in Sweden and 5 in Germany, conducted. All the German respondents were either leader of the WAG project or have been heavily involved in the process of introducing the WAG concept at their plant. The respondent in the Swedish companies held different positions but in almost all cases were they involved in logistics, production or production planning or held a position with an overview of the entire company.

Before conducting the interviews all respondents were sent the interview guide so that they could prepare the answers if necessary. In this and in every other contact with the respondent it was explained for whom and to what purpose the study was conducted. This is emphasized by Cassell and Symon (2004) as important in all kind of scientific research.

Most interviews were conducted over telephone but when possible, also personal interviews were conducted which allowed for a longer and deeper interview (Lekvall & Wahlbin, 2001). The length of the interviews ranged from 30 minutes up to two hours indicating that the respondents were interested in the subject. This might also explain why they chose to participate. No difference between the answers received through personal interviews and the answers from telephone interviews could be detected. The impression was that all respondent were sincere and honest. The only difference in answers detected by interviewer comes from the German versus the Swedish respondents and might originate from the interviewer’s insufficient understanding of German. This problem should not have any significant effect on the end result of this study.

When conducting an interview Cassell and Symon (2004) provide some helpful guidelines to consider. First, they stress the importance of getting the trust from the respondent in order to make him or her answer the questions truthfully. In addition to explaining the purpose as described above, confidentiality was assured, and information about feedback given. The possibility to read through any company specific material before publishing is not something mentioned by Cassell and Symon (2004) but was offered nevertheless. After these initial matters were dealt with, the interview could start. Cassell and Symon (2004) also point out that the order of the questions should be carefully thought through in order to have the most sensitive issues in the end when more trust had been gained. Cassell and Symon (2004) also say
that flexibility is the single most important success factor in qualitative interviewing. As the interviews were low-structured, the interviews could develop in different directions and the questions were therefore not always asked in the same order. Cassell and Symon (2004) also say that the way the questions are asked influence the responses. The questions were therefore formulated as single questions and not multiple questions that could confuse the respondent. Leading questions were also avoided, as the interviewee might feel obliged to answer the question in a certain way.

The gathered data is presented in two cases; Germany and Sweden. The findings are presented in accordance to the different areas identified in the specification of task and not after each case. This is chosen because it is in the interest of this study to find the differences in the mentioned areas and not to describe the cases as such.

### 5.1.8 Analysis and conclusions

For the analysis of data the logic of pattern-matching (Yin, 1994) is used. As a pattern nonequivalent dependent variables were chosen. These variables are the six fields described in chapter 4.3; IT experience and knowledge, change management, education, industrial complexity, culture, and process management. If these six variables concur with their predicted values strong causal inferences can be made (Yin, 1994). As the results not unanimously pointed in one direction there might be other causes not previously found or else might the predicted variable values be wrong. Also, as no theory relating Germany to Sweden was found in two of the six fields the possibilities for strong casual inferences are limited.

### 5.2 Methodological Discussion

During the entire project, it is important that one is critical towards the data collected and method chosen. In order to obtain a meaningful result the validity and the reliability should be considered (Lekvall & Wahlbin, 2001). Yin (1993) agrees with this but defines three parts of validity; construct validity, internal validity, and external validity.

Construct validity regards the number of sources the empirical data comes from (Yin, 1994). The data used in this study are the respondents at the different companies. Yin (1994) argues that the more respondents used the higher the construct validity is. In this study mostly one person per company has been interviewed. Only at two companies has more than one person been interviewed. This lowers the construct validity of the study. One way to increase the construct validity is to let the interviewees review their answers before data is analyzed (Yin, 1994). Due to the limited time frame available no reviewing has been possible for this study.
Internal validity is only relevant for causal studies where it is determined if something causes something else (Yin, 1994). As the third part, where the relationship between national differences and the suitability of the concept are drawn, the internal validity needs to be addressed. According to Yin (1994), high internal validity can be achieved through developing an alternative method for collection of information. Through using pattern-matching as a method for analysis, as done when comparing the empirical results to predicted findings, the internal validity can be increased (Yin, 1994).

External validity regards the problem if the results of the study can be generalized to other situations than the one analyzed (Yin, 1994). Yin (1994) argues that when case studies are criticized for their low generalizability it is the statistical generalizability that is referred to. The analytical generalizability can still be high even though the number of cases studied is far from the number of respondents in a cross-sectional study. Through examining more than one case and receiving a similar result when using the same logic the analytical generalizability should be regarded as high (Yin, 1994). This study involves five German companies and ten Swedish companies, but only through having multiple cases the analytical generalizability cannot be considered high. If the results from the different cases differ, the results cannot be generalized. The findings from the German companies concur with each other therefore implying a high generalizability for these companies. The Swedish companies present a larger difference in some parts and the results can therefore not be generalized as easily.

Reliability measures if the same conclusion would be reached if the study would be conducted again (Lekvall and Wahlbin, 2001). According to Yin (1993), the first step of ensuring a high reliability is to have the proper documentation. The study up to this point ensures that another study can be performed in the same way as this first one and therefore improves reliability. A problem is that as empirical data was gathered through interviews and that it is impossible to collect without influencing the respondent in some way (Lekvall and Wahlbin, 2001). Through adapting the suggestions of Cassell and Symon (2004) this influence was decreased as much as possible but still must the reliability of this study be questioned. The access problem described by Lekvall and Wahlbin (2001) where all the German companies found in the SCX group could not be interviewed and that Swedish companies were chosen by hand have surely lowered the reliability. This is also, according to Lekvall and Wahlbin (2001), often the case with case studies.
6 EMPIRICAL DATA

This chapter presents the information collected through interviews with companies in Germany and Sweden. This data is used for the analysis and answering of the specified research questions.

The results from the interviews are presented in two parts; Germany and Sweden. These two parts correspond to the interviews made. All companies, in both parts, are depersonalized, as many of the respondents did not wish to have their company name published publicly. The information is structured after the different fields specified in chapter 4 and not after the companies as it is more apt for this study to look at the aggregated characteristics and effects and not to map specific companies.

6.1 GERMANY

In this chapter, the interviews with the German companies are presented first starting with the effects experienced in the four first chapters. After that comes the description of the characteristics of the German companies, but first of all are the five German case companies briefly presented.

Company G1 is in the metal working industry and produces different products for the defense industry. G1 has production sites in different parts of the world and is a part of a larger group of defense industry companies. The yearly turnover for G1 is about € 350 million in total. The turnover for the plant that has implemented the WAG concept could not be revealed, but at the plant works 700 of totally 1800 employees.

Company G2 is as company G1 in the metal working industry and produces agriculture products and experiences heavy seasonal variations due to this. G2 is a more than 80 years old family owned company and employs 280 people with an annual turnover of € 35 million. The turnover varies due to the seasonal variations between € 0.5 million and € 5 million a month.

Company G3 is a producer of high-frequency technology products like RF coaxial connectors and wireless terminal components. G3 is as G2 family owned and has about 850 employees at the plant in interest for this study. The annual turnover is € 80 million.

Company G4 is also in the metal working industry and produces mechanical products for other companies in the group. G4 has a turnover of € 470 million and 450 employees.
Company G5 is a supplier to the automobile industry and has production sites worldwide. In Germany, there are 300 employees and company G5 has an annual turnover of € 65 million.

### 6.1.1 Delivery performance

All but company G1 said that they, after the WAG project, had seen a major improvement for the measure OTIFEF. The three companies – G2, G3, and G5 – that could specify their previous OTIFEF rate performed in the range of 50-60%. Today these values range from 91-100%. Company G1 that saw no improvement in OTIFEF deliveries stated that they already had perfect deliveries but that it was far easier to maintain this high level with the WAG concept.

When asking about increases in the delivery-to-request date the same answers were received. Four of the companies had seen major improvements while G1 already delivered close to 100% of their products on the requested date. To specify the size of the increase was very hard for most of the companies, as they had never considered this measure before. G5 was the only company that measured the deliveries-to-request date before and had seen an improvement from 55% to 85%.

The forecast accuracy had not improved for any of the five German companies after implementing the WAG concept. See table 1 for a summary of the effects the German companies experienced within delivery performance.

### Table 1: Delivery performance for the German companies.

<table>
<thead>
<tr>
<th></th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
<th>G4</th>
<th>G5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivery-to-</td>
<td>Always high</td>
<td>Improved considerably</td>
<td>Good improvements, to around 60%</td>
<td>Great improvements, only measuring towards this now</td>
<td>Improved from 55% to 85%</td>
</tr>
<tr>
<td>request date</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OTIFEF</td>
<td>Always high</td>
<td>From 50% to 95%</td>
<td>From about 60% to 95%</td>
<td>Improved to 100%</td>
<td>Improved from 60% to 91%</td>
</tr>
<tr>
<td>Forecast</td>
<td>No change</td>
<td>No change</td>
<td>No change</td>
<td>No change</td>
<td>No change</td>
</tr>
<tr>
<td>Accuracy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 6.1.2 Responsiveness

Company G2 and G3 could shorten the new product introduction (NPI) cycle time after the WAG project. G2 and G3 shortened the time with 20% and 50% respectively (table 2). The three other companies saw no change in the NPI cycle time.
All companies reduced the supply chain response time. When asking the companies about the aggregated supply chain response time all of them chose to answer with the production time, as this was the only measure considered by them. G2, G3, and G5 could specify the change and had shortened the throughput time with 20%, 75% and 30% respectively. Company G4 only saw a small improvement while the G1 improved the throughput time greatly though no number or range could be specified. G5 also stated that they had had the throughput time as the major incentive for the WAG concept.

The only company that could see that the time to flex production up or down with 20% had decreased was G5, though only with 5-8%.

Table 2: Responsiveness for the German companies.

<table>
<thead>
<tr>
<th></th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
<th>G4</th>
<th>G5</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPI cycle time</td>
<td>No change</td>
<td>Improvements of about 20%</td>
<td>Reduced with about 50%</td>
<td>No change</td>
<td>No change</td>
</tr>
<tr>
<td>Supply Chain Response Time</td>
<td>Great improvements in throughput time</td>
<td>Throughput time about 20% shorter</td>
<td>Standard products from 10-12 weeks to 3 weeks and non-standard products from a lot more than 20 weeks to 5 weeks</td>
<td>Slight improvement, are still using the WAG concept to shorten it</td>
<td>Throughput time about 30% shorter</td>
</tr>
<tr>
<td>Time to flex 20% up or down</td>
<td>No change</td>
<td>No change</td>
<td>No change</td>
<td>No change</td>
<td>Reduced with 8% 5-8%</td>
</tr>
</tbody>
</table>

6.1.3 Costs

Just as for the time to flex production only company G5 had seen a decrease in the order management costs with the WAG concept. The cost for material acquisition did not improve at any company. The costs that did change for all companies are the inventory carrying and manufacturing costs (table 3). Company G1 and G4 could not specify the change in the inventory carrying cost but were sure of that it had changed to the better. G5 had cut this cost with 20% and G3 managed to cut it with two thirds. G2 said that both the inventory carrying cost and the manufacturing cost had stayed the same while production volume had increased with about 20%. G1, G3, and G5 saw a drop in the manufacturing cost with 20%, 30% and 5-10% respectively. Company G4 could not specify with how much the manufacturing cost had decreased either.
Table 3: Costs for the German companies.

<table>
<thead>
<tr>
<th></th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
<th>G4</th>
<th>G5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order Management</td>
<td>No change</td>
<td>No change</td>
<td>No change</td>
<td>No change</td>
<td>Reduced with 10-15%</td>
</tr>
<tr>
<td>Material Acquisition</td>
<td>No change</td>
<td>No change</td>
<td>No change</td>
<td>No change</td>
<td>No change</td>
</tr>
<tr>
<td>Inventory Carrying</td>
<td>Slight improvement</td>
<td>Remained unchanged with production volume 20% higher</td>
<td>Reduced to a third of the original cost</td>
<td>Slight improvement</td>
<td>20% reduction</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Reduced with 20%</td>
<td>Remained unchanged with production volume 20% higher</td>
<td>Decreased with 30%</td>
<td>Small improvement</td>
<td>5-10% reduction</td>
</tr>
</tbody>
</table>

### 6.1.4 Asset management

Even though the companies were asked to comment on the inventory-days-of-supply, they chose to answer with the equivalent value inventory turns and all companies but G1 had experienced a major change to the better (table 4). G2, G4, and G5 had increased the inventory turns with 20%, 50% and 30% respectively but no one came close to the improvement company G3 saw. They increased inventory turns from 4 times a year to 16 times a year, an improvement of 400%. G1 that did not improve the inventory days-of-supply and stated that as they are in the defense industry they are obliged to carry inventory and spare parts for 40 years.

The degree of workload was improved at G1, G2 and G4 after the WAG concept was implemented. G1 said that they had a utilization level close to 100% before but that they are even closer now. G4 improved the degree of workload from 85% to 95%. G2 that produces seasonal products has previously had big problems of scheduling the need for employees. This can now be done more correctly and the degree of workload has therefore increased in the periods of lower activity from about 50% to 80%. The two other companies did not see any change in the degree of workload.

Table 4: Asset management for the German companies.

<table>
<thead>
<tr>
<th></th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
<th>G4</th>
<th>G5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory Turns</td>
<td>N/A</td>
<td>Improved with about 20%</td>
<td>Increased from 4 to 16 times a year</td>
<td>Improvement of 50%</td>
<td>Improved from 6 to 8 times a year</td>
</tr>
<tr>
<td>Workload</td>
<td>Increased slightly and is even closer to 100% now</td>
<td>Periods of low workload improved from a 50% utilization to about 80%</td>
<td>No change</td>
<td>Increased from 85% to 95%</td>
<td>No change</td>
</tr>
</tbody>
</table>
6.1.5 IT Experience and Knowledge

All the German companies show up an overall moderate IT level. Company G1 has a very long experience of state-of-the-art software but a lower understanding for IT among the employees. G4 has worked with an ERP-system while G2, G3, and G5 used many different systems, e.g. MS Excel, to cover this need. The understanding for IT among these companies is moderate. They have all worked with IT for 20-30 years but the employees are not that used to IT (table 5).

Companies G1, G2 and G4 have no IT department at the local plant but G1 and G4 have access to a central IT department. At G1, G2 and G4 the different managers are responsible for IT in his/her department/group/team and one person responsible for IT. Company G1 has an IT manager, G2 has a hardware manager and a data processing manager responsible for software, and company G4 has the finance and controlling manager as the responsible for IT. Companies G3 and G5 both utilize a local IT department. At G3, there are ten people mostly responsible for hardware and then there are key users in every department that are responsible for the software used there. At G5, the IT department consists of seven people, which are responsible for both software and hardware.

Table 5: IT experience and knowledge for the German companies.

<table>
<thead>
<tr>
<th>State-of-the-art</th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
<th>G4</th>
<th>G5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experience</td>
<td>30-40 years</td>
<td>20 years but only in some departments</td>
<td>20 years</td>
<td>25 years</td>
<td>20 years</td>
</tr>
<tr>
<td>Knowledge</td>
<td>Hard for employees to understand APS</td>
<td>N/A</td>
<td>Moderate understanding of IT</td>
<td>High IT knowledge, almost everyone have become training</td>
<td>N/A</td>
</tr>
<tr>
<td>Department</td>
<td>Central IT department with local IT manager</td>
<td>Local IT department</td>
<td>Local IT department of ten people and work with key users</td>
<td>Central IT department. Finance and controlling manager locally responsible. Each manager in charge of IT for his/her group</td>
<td>Local IT department of seven people</td>
</tr>
</tbody>
</table>
6.1.6 Change Management

Common for all the companies is that their managers are very committed to change and follow change projects closely when they have decided to change. How much focus that is put on change and the will to change differs between the five companies where company G1, as seen in table 6, works actively with continuous improvement and Kaizen while companies G2 and G5 do not show the same openness towards change. The usage of project plans and other measures for controlling projects also differs between the companies. This time G3 and G4 show a very good system of breaking down goals and responsibilities for each member. All companies but G2 break down the company’s strategic goals to departmental and/or team levels.

Table 6: Change management for the German companies.

<table>
<thead>
<tr>
<th>Will to change</th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
<th>G4</th>
<th>G5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous improvements</td>
<td>OK before WAG project</td>
<td>Low to OK will to change</td>
<td>Change for customers not otherwise</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Defined goals, roles and responsibilities</th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
<th>G4</th>
<th>G5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project plans with responsibilities. Goals are broken down to team levels</td>
<td>No</td>
<td>Have project plans</td>
<td>Had plans with goals and responsibilities but no roles</td>
<td>Have project plans with goals</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Committed management</th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
<th>G4</th>
<th>G5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management supports change very strongly</td>
<td>Very committed managers</td>
<td>Very committed managers</td>
<td>Very involved managers</td>
<td>Management very committed</td>
<td></td>
</tr>
</tbody>
</table>

6.1.7 Education and Learning

Only three of the five interviewees could specify the educational levels in their company (table 7). Company G3 said that it was moderate with some of the white-collar workers having studied at university level and other having a background in production. Company G4 said that most of their white-collar workers lack formal education and come from production while G5 said that they have many employees with a university degree and even some with a post-graduate degree. The two companies that could not specify the educational levels in their company, G1 and G2, stated that the distribution of white-collar workers is approximately 50%. This is also the rate for G5. G3 and G4 could not give any distribution for white-collar versus blue-collar workers.

Regarding in-house training, companies G1, G3 and G4 show a strong performance with clear goals for each employee while G2 and G5 do not focus on in-house training.
Table 7: Education and learning for the German companies.

<table>
<thead>
<tr>
<th></th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
<th>G4</th>
<th>G5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal</td>
<td>N/A</td>
<td>N/A</td>
<td>High education</td>
<td>Low formal education</td>
<td>Very high formal education, even up to post-graduate level</td>
</tr>
<tr>
<td>% white collar workers</td>
<td>50%</td>
<td>50%</td>
<td>N/A</td>
<td>N/A</td>
<td>50%</td>
</tr>
<tr>
<td>In-company training</td>
<td>Much</td>
<td>Low</td>
<td>Has always been important</td>
<td>Task-focused education</td>
<td>Does occur</td>
</tr>
</tbody>
</table>

6.1.8 Cultural Readiness

Three companies – G1, G3, and G5 – state that they are very hierarchical while G2 and G4 regard themselves as fairly flat (table 8). The openness does not depend on hierarchies according to the interviewees as all companies except G4 think that they have open lines of communication in their companies. G4 does not think that the atmosphere is very open. Though considering themselves open companies G1 and G3 say that there are barriers for communication over functional boundaries and that not everyone feels secure with passing information on to other departments.

Data accuracy is low in all five companies, which indicates that all of them have poor working methods, e.g. routines for entering and reporting data. In addition to this, almost no processes and tasks have been mapped and because of this, all actions are based on experience.

Table 8: Cultural readiness for the German companies.

<table>
<thead>
<tr>
<th></th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
<th>G4</th>
<th>G5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Openness</td>
<td>Moderately open</td>
<td>Open</td>
<td>Open</td>
<td>Not that open</td>
<td>Open</td>
</tr>
<tr>
<td>Hierarchies</td>
<td>High</td>
<td>Flat</td>
<td>Very high</td>
<td>Flat</td>
<td>Hierarchical</td>
</tr>
<tr>
<td>Data accuracy</td>
<td>Bad</td>
<td>Low</td>
<td>Low</td>
<td>Not always good</td>
<td>Low</td>
</tr>
</tbody>
</table>

6.1.9 Industrial Complexity

Companies G1, G2 and G4 all produce very complex products with multiple planning levels (table 9). G2 states that their products have up to six planning levels and G4 have about eight planning levels for their products. G3 and G5 have a lower complexity in their production but instead they are carrying a very wide range of products. The complexity for G1, G2 and G4 is lowered as they do not carry as many different products.
Table 9: Industrial complexity for the German companies.

<table>
<thead>
<tr>
<th>Complexity</th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
<th>G4</th>
<th>G5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complexity</td>
<td>Very complex products</td>
<td>Very complex products</td>
<td>Moderate complexity</td>
<td>Very complex products</td>
<td>Medium complexity</td>
</tr>
<tr>
<td># of products</td>
<td>Few</td>
<td>Few</td>
<td>Many</td>
<td>Few</td>
<td>Many</td>
</tr>
</tbody>
</table>

6.1.10 Process Management

G1, G2 and G3 were all, as can be seen in table 10, functionally organized before the WAG concept was introduced. G4 and G5 were both organized in a matrix organization with both functions and processes specified. Though G1 was functionally organized, there was a strong focus on cross-functional teams and the understanding among the employees for processes was high. The understanding for processes was also high in the two matrix organized companies while G2 and G3 stated that their employees were not as ready to work in processes. G1, G4, and G5 also assessed the performance of the cross-functional and processual activities with comprehensible measurements. G1 and G5 measured e.g. quality, cost, and quantities. G4 had taken one step further and evaluated their processes with an advanced KPI system.

Table 10: Process management for the German companies.

<table>
<thead>
<tr>
<th>Alignment</th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
<th>G4</th>
<th>G5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment</td>
<td>Functional</td>
<td>Functional</td>
<td>Functional</td>
<td>Started to change towards processes or matrix organization</td>
<td>Matrix</td>
</tr>
<tr>
<td>Understanding</td>
<td>Good, have used many cross-functional teams</td>
<td>Low understanding and experience for processes</td>
<td>Low, used few cross-functional teams</td>
<td>Have long experience from many cross-functional teams</td>
<td>Low, used few cross-functional teams</td>
</tr>
<tr>
<td>Measurements</td>
<td>Evaluated e.g. quantity and quality for cross-functional teams</td>
<td>No process evaluation</td>
<td>No evaluation</td>
<td>Used advanced system for evaluating processes</td>
<td>Cost and quality was evaluated for processes</td>
</tr>
</tbody>
</table>

6.2 Sweden

Just as for the German case, the Swedish companies are in a few words presented before their characteristics are described.

Company S1 is a small but worldwide company with 110 employees and an annual turnover of € 23 million. S1’s products are sold mainly in the marine sector. S1 is part of a larger group of companies.
Company S2 is in the engineering industry and produces tools for metal working and supplies all industry branches. S2 has just over 1000 employees and a turnover of €125 million.

Company S3 produces profiles of mainly aluminum. They have an annual turnover of €240 million and 1400 employees. Their main customer segment is the automotive industry but they also sell their products to the building and telecommunication industries.

Company S4 produces peripheral equipment for the automobiles. They are worldwide market leader for their products, employ 300 persons, and have an annual turnover of approximately €400 million.

Company S5 has 1400 employees and has a turnover of €250 million. S5 manufactures products for the mining industry. They are a part of a larger worldwide group of companies.

Company S6 is in the metal working industry and often produces complex products in short series. They used to be a part of a larger group of companies but are today privately held. They have an annual turnover of €8 million and 75 employees.

Company S7 is a 1st- and 2nd-tier supplier to the automotive industry. They have about 300 employees and a turnover of €40 million.

Company S8 is a part of larger group of companies in the telecommunication industry. They have approximately 1000 employees and cannot specify their turnover due to confidentiality reasons.

Company S9 is an internal supplier, even though external customers have been acquired lately. S9 is producing components for the construction equipment industry and have 700 employees and an annual turnover of €100 million.

Company S10 delivers products for the manufacturing and mining industries. They are a part of larger group of companies, employ 400 persons, and have a turnover of approximately €70 million.
6.2.1 IT Experience and Knowledge

All companies but S10 are working with state-of-the-art software including ERP and sometimes APS systems (see table 11). S10 uses an old mainframe system developed by the company. S10 is starting to change to an ERP system but not in all departments.

All ten companies have long experience from IT in the company and a very good understanding of IT among the employees. Especially good in these two fields do S3, S4, S7 and S8 perform with young employees and an extensive use of IT.

Five of the companies – S2, S4, S7, S9, and S10 – all have an IT-department. S8 is the only company that has access to a central IT-department. The other companies without either local or central IT-department use consulting services when the in-company IT-knowledge is not enough. S1 stated that each manager is responsible for the IT in his/her department and S5 said that all employees report to the controller in all IT matters.

Table 11: IT experience and knowledge for the Swedish companies.

<table>
<thead>
<tr>
<th></th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State-of-the-art</strong></td>
<td>ERP system with good functionality but lack planning capabilities</td>
<td>ERP and APS systems</td>
<td>ERP and &quot;homemade&quot; APS system</td>
<td>ERP system</td>
<td>ERP system</td>
</tr>
<tr>
<td><strong>Experience</strong></td>
<td>Long experience</td>
<td>Long experience with the previous self-programmed mainframe IT system</td>
<td>Long experience from many different IT systems</td>
<td>More than 20 years of experience from many different systems</td>
<td>More than 15 years of experience</td>
</tr>
<tr>
<td><strong>Knowledge</strong></td>
<td>Very good knowledge with lots of in-company IT training</td>
<td>Moderate IT knowledge</td>
<td>Good knowledge</td>
<td>Good IT maturity in the company with a low mean age</td>
<td>Good IT knowledge in the company</td>
</tr>
<tr>
<td><strong>Department</strong></td>
<td>IT manager with all managers responsible for his/her department. Have support contract with software suppliers</td>
<td>Have their own IT department</td>
<td>IT manager but no IT department</td>
<td>Have IT department</td>
<td>No IT manager, use consulting services</td>
</tr>
</tbody>
</table>
6.2.2 Change Management

In general, the Swedish companies are willing to change (table 12). Three companies – S3, S8, and S10 – say that their will to change is low though S8 state that it has improved over the last few years. S10 is in an old industry and has a high mean age in the company. They focus on the customer and change when the customers demand it but not earlier. Of the other seven companies, three companies are performing especially well in this field. S1 is working with continuous improvements and has always multiple change projects running. The management is a strong force behind these projects. S6 is privately held and has a very strong commitment to change through the new owners. S7 has a young, well-educated, and ambitious management that focus on change. According to S7, you have to be very competitive and open towards change if you are a supplier to the automotive industry. The companies with the best will to change also state that their management is very committed to change while the companies that do not focus as much on change have a less committed management. S5 says that they focus mainly on growth and that the management is very committed to this but that the commitment to other projects could not be assessed.
S1, S4, S7, S8, and S9 all have good project plans with goals and responsibilities defined. Particularly good are the plans at S8 where the different roles within a project are very well described.

Table 12: Change management for the Swedish companies.

<table>
<thead>
<tr>
<th></th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will to change</td>
<td>High will to change, work with continuous</td>
<td>High will to change</td>
<td>Not the best will to change</td>
<td>Very high will to change</td>
<td>Open towards change</td>
</tr>
<tr>
<td></td>
<td>improvement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defined goals,</td>
<td>Break down goals to department level and are</td>
<td>Goals broken down and project plans exist</td>
<td>Goals are broken down to department level</td>
<td>Routines for projects and other tasks</td>
<td>Project plans with goals and responsibilities</td>
</tr>
<tr>
<td>roles and</td>
<td>working with mapping and describing tasks and</td>
<td></td>
<td></td>
<td>established</td>
<td>and break down goals</td>
</tr>
<tr>
<td>responsibilities</td>
<td>processes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Committed</td>
<td>Very committed management</td>
<td>Committed management</td>
<td>Managers committed</td>
<td>Very committed managers</td>
<td>Very committed to growth</td>
</tr>
<tr>
<td>management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

|                  | S6                                           | S7                                           | S8                                           | S9                                           | S10                                          |
| Will to change   | Very high will to change                     | High will change                             | Not the highest will to change               | Are working proactively with change          | Low will to change                           |
| Defined goals,   | No project model                             | Project plans with goals and responsibilities | Very good project plans with roles and       | Have project plans with goals and            | Project model exist but is not often used,   |
| roles and        |                                              |                                              | responsibilities. Goals are broken down but  | responsibilities                               | break down goals                             |
| responsibilities |                                              |                                              | not always updated                           |                                              |                                              |
| Committed        | Privately held and very committed management | Very committed management                   | Moderate commitment from managers            | Committed management                         | Not that committed to change                 |
| management       |                                              |                                              |                                              |                                              |                                              |

6.2.3 Education and Learning

The share of white-collar workers at S1 is 50%, the highest of all the interviewed Swedish companies that could specify the white-collar ratio, S4, S7 and S10 could not (table 13). S2 has 36% white-collar employees and the other companies have white-collar workers in the range from 20-30%. The level of education is high in S5, S8, S9, and S10 with many of the white-collar workers being engineers and blue-collar workers are educated at upper secondary school, sometimes to being an industrial
specialist, e.g. welders, fitters, operators. S1 and S2 could not assess the educational level at their companies. Only at S6 is the educational level remarkably low with few employees from the university and many being old self-taught men or educated through apprenticeship.

All companies work with personal development plans where the in-company training is specified. Only S6 does not work that much with in-company training.

Table 13: Education and learning for the Swedish companies.

<table>
<thead>
<tr>
<th></th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal</td>
<td>Good, on the rise</td>
<td>N/A</td>
<td>Good</td>
<td>Good, but could be higher</td>
<td>Highly educated workforce</td>
</tr>
<tr>
<td>% white collar workers</td>
<td>50%</td>
<td>36%</td>
<td>25%</td>
<td>N/A</td>
<td>30%</td>
</tr>
<tr>
<td>In-company training</td>
<td>Central themes like barcodes, kanban and the ERP system</td>
<td>Part of the individual development plan</td>
<td>N/A</td>
<td>Does exist</td>
<td>Good in-company training with personal as well as company purposes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>S6</th>
<th>S7</th>
<th>S8</th>
<th>S9</th>
<th>S10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal</td>
<td>Some employees have higher education, otherwise low</td>
<td>Good educational levels</td>
<td>University level of white-collar workers and upper secondary school for blue-collar workers</td>
<td>Blue-collar workers are often trained specialist from industrial upper secondary school</td>
<td>White-collar workers are engineers and blue-collar workers have upper secondary schooling</td>
</tr>
<tr>
<td>% white collar workers</td>
<td>25%</td>
<td>N/A</td>
<td>20%</td>
<td>28%</td>
<td>N/A</td>
</tr>
<tr>
<td>In-company training</td>
<td>Are not working with in-company training that much</td>
<td>Use individual development plans</td>
<td>Well described with educational ladders. Every employee has a number of days for training</td>
<td>Personal development plans where in-house training is an important part</td>
<td>Exists and is rated as good</td>
</tr>
</tbody>
</table>

6.2.4 Cultural Readiness

All Swedish companies but S8 stress their open and informal atmosphere and that it is very easy to communicate over functional boundaries (table 14). S8 has specified
channels for communication and information but state that it is possible to communicate outside these. Common for all the Swedish companies are also the low hierarchies and flat organizations. S1, S2, S8, S9, and S10 are slightly more hierarchical than the other five. Especially flat and informal is the small company S6.

S1, S8, and S10 have low data accuracy and find this a problem. S2, S5, S6, and S9 have good or very good data accuracy and this is something they focus on and explain the importance of to the employees. All companies are working with mapping and describing routines, processes, and tasks or have already done this to some extent. Not one company has specified all processes and tasks.

**Table 14: Cultural readiness for the Swedish companies.**

<table>
<thead>
<tr>
<th></th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Openness</strong></td>
<td><strong>Very open lines of communication</strong></td>
<td><strong>Very open and informal atmosphere</strong></td>
<td><strong>Very open and informal</strong></td>
<td><strong>Very open atmosphere</strong></td>
<td><strong>Very informal and open atmosphere</strong></td>
</tr>
<tr>
<td><strong>Hierarchies</strong></td>
<td><strong>Medium hierarchies, trying to flatten organization</strong></td>
<td><strong>Medium hierarchies, easy to take contact over functional boundaries</strong></td>
<td><strong>Low hierarchies</strong></td>
<td><strong>Not very hierarchical</strong></td>
<td><strong>Very flat in production, slightly more hierarchical in other departments</strong></td>
</tr>
<tr>
<td><strong>Data accuracy</strong></td>
<td><strong>Sometimes catastrophic</strong></td>
<td><strong>Pretty good data quality</strong></td>
<td><strong>Low data accuracy</strong></td>
<td><strong>Can sometimes be low</strong></td>
<td><strong>Is good and is focused on</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>S6</th>
<th>S7</th>
<th>S8</th>
<th>S9</th>
<th>S10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Openness</strong></td>
<td><strong>Very informal and open</strong></td>
<td><strong>Very open</strong></td>
<td><strong>Pre-defined communication routes, but still pretty open</strong></td>
<td><strong>Very informal and open atmosphere</strong></td>
<td><strong>Open lines of communication</strong></td>
</tr>
<tr>
<td><strong>Hierarchies</strong></td>
<td><strong>Very flat organization</strong></td>
<td><strong>Pretty flat</strong></td>
<td><strong>Flat organization</strong></td>
<td><strong>Nor flat or hierarchical</strong></td>
<td><strong>Pretty hierarchical</strong></td>
</tr>
<tr>
<td><strong>Data accuracy</strong></td>
<td><strong>Great increases lately, today good</strong></td>
<td><strong>Moderate accuracy, stressed by customers</strong></td>
<td><strong>OK, but have problems with keeping a good level</strong></td>
<td><strong>Is good and rated as important</strong></td>
<td><strong>Not that good but are working on it</strong></td>
</tr>
</tbody>
</table>

**6.2.5 Industrial Complexity**

All companies but S2 manufactures complex or very complex products with multiple planning levels (table 15). S1, S4, and S6 use a functional workshop and S1 and S6 make customer specific orders. Company S2 does not have that complex products but
has instead many different products to control. In addition, companies S1, S3, and S5 have a wide range of products.

Table 15: Industrial complexity for the Swedish companies.

<table>
<thead>
<tr>
<th></th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Complexity</strong></td>
<td>High complexity</td>
<td>Not so complex products</td>
<td>Complex products and a complex environment</td>
<td>High complexity</td>
<td>Very complex products</td>
</tr>
<tr>
<td><strong># of products</strong></td>
<td>Many different products</td>
<td>Wide range of products</td>
<td>Many products</td>
<td>Not that many products</td>
<td>Many products</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>S6</th>
<th>S7</th>
<th>S8</th>
<th>S9</th>
<th>S10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Complexity</strong></td>
<td>Very complex products</td>
<td>Complex products and demanding industry</td>
<td>Complex products</td>
<td>High complexity</td>
<td>Medium complexity</td>
</tr>
<tr>
<td><strong># of products</strong></td>
<td>Moderate number of products</td>
<td>Not that many products</td>
<td>Few products</td>
<td>Not that many products</td>
<td>Many products</td>
</tr>
</tbody>
</table>

6.2.6 Process Management

Reviewing the Swedish companies three different groups of companies emerge. There are the ones with classical functional organization, a low understanding for processes in the company and no measurements for evaluating processes or cross-functional activities (table 16). In this group, we can find S2, S4, S7, and S10. The second group consists of S5, S6, and S9 and these companies are trying to implement more processes and have a moderate in-company understanding for processes. S9 uses some metrics for evaluating their processes while S5 and S6 do not. In the last group S1, S3, and S8 can be found. They are organized after their processes, have a very good understanding for processes, and apply different metrics and measures for evaluating these processes.
Table 16: Process management for the Swedish companies.

<table>
<thead>
<tr>
<th></th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alignment</strong></td>
<td>Are changing to process structure</td>
<td>Functional</td>
<td>Use a supply function and have a strong focus on processes</td>
<td>Are changing towards a process way of thinking and working</td>
<td>Functional, some cross-functional teams</td>
</tr>
<tr>
<td><strong>Understanding</strong></td>
<td>Very good understanding for processes</td>
<td>Poor understanding for processes</td>
<td>Very good understanding</td>
<td>Not so process minded</td>
<td>Some understanding for processes</td>
</tr>
<tr>
<td><strong>Measurements</strong></td>
<td>Evaluate processes</td>
<td>No evaluation</td>
<td>Have defined metrics for process evaluation</td>
<td>No evaluation</td>
<td>No evaluation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>S6</th>
<th>S7</th>
<th>S8</th>
<th>S9</th>
<th>S10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alignment</strong></td>
<td>Normally functional structure, for larger orders are certain project teams used</td>
<td>Functional organization</td>
<td>Process driven organization with functions in each process</td>
<td>Are moving towards a process organization but are far from the goal</td>
<td>Functional organization, almost no cross-functional activities</td>
</tr>
<tr>
<td><strong>Understanding</strong></td>
<td>Not that process minded</td>
<td>Low understanding of processes</td>
<td>Very good understanding of processes</td>
<td>Moderate understanding of processes</td>
<td>Poor understanding of processes</td>
</tr>
<tr>
<td><strong>Measurements</strong></td>
<td>No evaluation</td>
<td>No evaluation</td>
<td>Use different tools and metrics for process evaluation</td>
<td>Have different metrics for process evaluation but these are not always used</td>
<td>No evaluation</td>
</tr>
</tbody>
</table>
7 ANALYSIS

The differences and similarities found between Germany and Sweden are here analyzed according to the structure in chapter 4. In addition to this, it is also analyzed how these differences and similarities, primarily differences, affect the WAG concept.

7.1 EFFECTS OF WAG CONCEPT

The first specified research question dealt with the effects the SCX companies experienced through the WAG concept. Interesting is that not all metrics improved after the WAG implementation but at least one metric from each of the four fields; Delivery performance, Responsiveness, Costs, and Asset management, did.

With the WAG concept, the companies were able to deliver their products on time, in full and error free, OTIFEF, practically all the time. To improve further, the German companies now started to measure delivery performance, not against the date promised, but against the date requested by the customer. Through the WAG concept, this metric could be improved greatly too. This increase in delivery performance was to some extent made possible through the reduction of throughput time that all five companies experienced. The reduction of throughput time is in line with the findings of Stadtler and Kilger (2000) who say that as the visibility is increased, bottlenecks can be detected and remedied and capacities better utilized. They (Stadtler and Kilger, 2000) continue by saying that the increased visibility will improve on-time deliveries. Improvement in customer service and delivery reliability is, according to Cooper and Ellram (1993), Gampenrieder (2004), and Sandberg (2005), results of Supply Chain Management as well. Gampenrieder (2004) identifies reductions in throughput time as a result of SCM too.

The cost related improvements were seen in the fields of inventory and manufacturing costs. This coincides with what Stadtler and Kilger (2000), on the one hand, anticipated – a decrease in production costs and what Cooper and Ellram (1993) and Gampenrieder (2004), on the other hand, expected – reductions in inventory related costs. The most outstanding cost reduction was recorded at company G3 that cut their inventory carrying costs with two thirds while the other companies saw more moderate reductions in the range of 5-30%. The inventory carrying cost is connected to the inventory turns-metric and all companies but one have also seen an increase in the inventory turns. Again, G3 is the top performer with an increase of 400%.
7.2 DIFFERENCES AND SIMILARITIES

The characteristics of the German and Swedish companies presented in chapter 6 are here analyzed and compared to each other as well as to theories found in order to see what differences and similarities there are between manufacturing midsized companies in the two countries. This chapter corresponds to the specified research questions that aim at describing how the German and Swedish companies perform in the six different success factors and what the differences and similarities are, thus the specified research question from chapter 4.2 and the first part of the specified research question in chapter 4.3.

7.2.1 IT Experience and Knowledge

The theory hinted that the IT experience and knowledge would be a little bit higher in Sweden than in Germany (www.weforum.org) and this is what the result from the interviews point at. Almost all companies have long experience from IT but when asked about the knowledge about IT in their company the Swedish respondents generally state a better situation. Another thing that is noted is that the level of IT in the German companies differs a lot while the level in the Swedish companies is generally higher than in Germany. G3 used e.g. an MRP system and G1 had a complete ERP system while the Swedish companies all use ERP systems. This might be connected to the higher understanding of IT in Sweden. The use of an IT-department, local or central, occurs in both Sweden and Germany. More that can be said is that through the Swedish interviews it came up that consulting services are sometimes used. Four of the Swedish companies S1, S3, S5, and S6 do not have access to any IT-department making one think that these companies all use external companies for this function. That this function has been outsourced might be connected with a higher knowledge of what to outsource and how and when to buy it.

7.2.2 Change Management

Seven of the ten Swedish companies have a high or very high will to change where only one company in Germany, G1, state that they have a high will to change. This is in line with the findings of Hofstede (www.geert-hofstede.com) who says that the uncertainty avoidance is far lower in Sweden than in Germany. Another difference is that all German companies state that their management is very active and supportive in projects while Swedish managers did not participate as much. This might be connected with the flat organizations where responsibility is delegated to the employees in Sweden.
No difference could be detected in the use and structure of project plans which both Al-Mashari et al. (2003) and Stewart (1995) highlighted as important.

### 7.2.3 Education and Learning

The share of white-collar workers is lower in Sweden than in Germany, which reflects the lower hierarchies in Sweden. In Germany, all the three companies that answered this question stated a share of 50%, while the Swedish companies range from 20% up to 50% white-collar workers. In both Germany and Sweden, only one company has a low educational level while seven companies in Sweden and two in Germany have a high level. This indicates that the findings in the OECD study (www.oecd.org), that the educational level is higher in Sweden, are correct.

In-house training seems to be equally spread in Germany and Sweden with some companies focusing strongly on it, like G1, G3, S5, S8, and S9, while others, e.g. G2 and S6, do not focus that much on in-house training.

### 7.2.4 Cultural Readiness

The openness is clearly higher in the Swedish companies than in the German ones. Nine Swedish companies say that they are open or very open while only three German ones say that they are open. This is what was predicted by Hofstede (www.geert-hofstede.com) and Birkinshaw (2002). In addition to this, the hierarchies are lower in the Swedish companies, something that Hofstede (www.geert-hofstede.com) and Birkinshaw (2002) said too.

The data accuracy is higher in Swedish companies and this is something many Swedish companies have focused on, e.g. S5 and S9. The German companies all say that their accuracy level is low or bad.

### 7.2.5 Industrial Complexity

When comparing the companies in Sweden and Germany for industrial complexity, no difference can be found. Both in Sweden and in Germany there are companies with high complexity product or with a wide range of products. In Sweden, three companies, S1, S3, and S5, with both complex and many products could be found. Through comparing industries in the two countries, no difference could be found either and both countries should be ranked as high complex industries.

### 7.2.6 Process Management

Just as in Germany, the Swedish companies have reached different levels of process alignment. What can be seen is that two of the Swedish companies, S3 and S8, are
fully aligned after their processes while the two most process-minded companies in Germany, G4 and G5, had a matrix-like organization. The theory mentions no differences between how well processes are spread in Germany versus Sweden but this does not exclude that there might be such a difference. Swedish organizations can therefore be found slightly better in process management than German companies. In the use of process measurements there are no difference between Sweden and Germany.

7.2.7 Summary of differences and similarities

In short, the differences and similarities can be summarized as:

- Higher IT experience and knowledge in Sweden
- Outsourcing of the IT function in Sweden
- Higher will to change in Sweden
- More active management in Germany
- Slightly higher educational levels in Sweden
- More white-collar workers in Germany
- More open atmosphere in Sweden
- More hierarchical organizations in Germany
- Better working methods in Sweden
- Same industrial complexity
- More processes in Sweden

7.3 Effects on WAG Concept

In this chapter the last part of the specified research question from chapter 4.3, how the differences and similarities affect the WAG concept, is analyzed.

The WAG consultants said that it is better if the company could program the interface between the ERP and APS systems. In Sweden, on the one hand, are both the IT experience and knowledge higher than in Germany, which indicates, according to Motwani et al. (2005), that Swedish companies have a better possibility at programming the interface themselves. On the other hand, some Swedish companies have outsourced their IT department leaving them with no possibility to program the interface.

In Sweden there is a high will to change. This is positive for WAG, as they need the employees to want to change in order to make their concept successful. Negative is
that the Swedish managers are not as active in change projects as their German counterparts which according to Umble et al. (2003) is an important success factor.

According to the OECD study (www.oecd.org) the educational level is higher in Sweden. Only a slight difference in the answers in favor of Sweden could be detected but should according to Motwani et al. (2005) indicate a lower resistance towards change in Sweden, which also Birkinshaw (2002) has detected. However, there are fewer white-collar workers in the Swedish companies and this fact evens out the educational difference. This should therefore not affect the WAG concept.

The Swedish companies are found more open and less hierarchical than the German ones which is in line with the findings of Hofstede (www.geert-hofstede.com) and Birkinshaw (2002). As quick communications, according to the WAG consultants, and openness, according to Motwani et al. (2005) and Al-Mashari et al. (2003), are good for IT projects, Swedish companies should perform well. The WAG consultants are not that positive to flat organizations as strong hierarchies can speed up some communications and decisions, but since the Swedish companies are so open the lack of hierarchies should not be a great barrier for the WAG project. The good working methods in Sweden, stressed by Stewart (1995), imply a fast and smooth implementation process.

As there is the same industrial complexity in Sweden as in Germany this should be no barrier for the WAG concept either. What simplifies the introduction of the WAG concept in Sweden is, according to Al-Mashari et al. (2003), that Swedish companies are more aligned after processes. There is also a better understanding for processes in the Swedish companies, which also improve the possibilities for a successful implementation in Sweden.
8 CONCLUSIONS

The key findings from the analysis are here highlighted and further developed into the conclusions of the master thesis.

The purpose of this study was to determine the effects the WAG concept has on SCM in German companies and how the concept needs to be changed to fit Swedish companies. This is a first step towards assessing the potential of a successful entry onto the Swedish market. In this chapter, the results of this study will be shaped into conclusions about the potential of a success in Sweden. As a market entry strategy contains many parts not touched on in this study only the parts in immediate connection to this study will be discussed. These parts are if the concept fits Swedish companies and if the effects in Germany can be transferred to Sweden.

When analyzing the differences and similarities in characteristics between the German and Swedish companies some differences are of special interest as they might affect the success of the WAG concept in Sweden. Several factors indicate a very good chance for Swedish companies to succeed with implementing the WAG concept and reaching best-practice SCM. Although many positive differences, there are also some factors that might be potential threats for the WAG successfulness in Sweden.

First, the fact that some Swedish organizations have outsourced their IT department means that they have no possibility to program the common interface, which according to the WAG consultants is a success factor. Second, that the management is more active in German change projects than in Swedish ones is also a problem as the project team from WAG, according to Motwani et al. (2005), needs the full and active support from the management when introducing their concept. Third, the lack of hierarchies and therefore the potential for a slow decision making process is important to deal with as speed is important for the project.

Differences that make Swedish companies more ready for the WAG concept than German ones are that there is a higher IT experience and knowledge in Sweden, which is also proven through the NRI ranking performed by the World Economic Forum (www.weforum.org). This together with high educational levels, validated both through this study and the OECD-study (www.oecd.com), and a very high will to change makes Sweden a suitable country for IT change projects, such as the WAG project. The will to change, or the uncertainty avoidance, is something found considerably better in Sweden in this study, as well as by Hofstede (www.geert-hofstede.com) and Birkinshaw (2002). The open and informal atmosphere and the
efficient working methods, stressed by the WAG consultants and Motwani et al. (2005), in Swedish companies can amend the loss of speed in communication and decisions that the lack of hierarchies caused. Finally yet importantly, the understanding for working in processes is higher in Sweden, which lowers the resistance against aligning the company after these processes. The processual perspective could not be confirmed by any researched but should never the less be seen as an advantage when implementing the WAG concept in Sweden.
9 RECOMMENDATIONS & DISCUSSION

To develop the findings and conclusions of this thesis further, they are in this chapter discussed and recommendations are made in order to overcome the potential barriers for the WAG concept in Sweden. A discussion about possible extensions to clarify some of the findings in this study is also brought up as well as implications of the results in a broader spectrum.

As seen in previous chapters, there are some differences between Swedish and German companies that affect the possibility for a successful implementation of the WAG concept in Swedish companies. In order to attain the best possible implementation in Sweden, the concept needs to be adapted to the Swedish culture and the Swedish companies.

One success factor is that the customers to WAG themselves can program the interface between the present ERP system and the WAG APS module. In some of the Swedish companies, the IT-department has been outsourced, which might threaten the success of the project. For the programming of the interface, either WAG or an external client can be used, but detailed knowledge about the system will, due to this, never reach the customer. Extensive training of the key-users can be one way around this problem. It would also be interesting to investigate if the outsourcing of the IT department is a general trend in companies today and if, and if so why, this is a purely Swedish tendency.

The managing consultants at Wassermann and Umble et al. (2003) stated that the commitment from the management is an important success factor, as they need to motivate and explain the importance of this change project to the employees. As the managers are less committed in Sweden than in Germany, this can be a potential problem. Without the support from the management, the employees will not change but as the will to change is higher in Sweden and the workforce has a higher education the problem with employees resisting the change will be smaller in Sweden than in Germany. However, it may still be good to stress the importance to the management that they should be active and committed to the project.

A last threat against a successful WAG implementation in Sweden is the lack of hierarchies. Speed is crucial factor in any project and the WAG consultants had seen that decisions could be made faster in strong hierarchies. Another factor influencing the speed of the project is the Swedish tendency to make consensus decisions where everyone need to agree before a decision can be made. This is something that has not
been touched upon in this study and it would be interesting to find out more about how
the Swedish consensus mentality affects a change project. Due to this mentality a
longer timeframe might be allowed without the success of the project is threatened. If
not, this mentality can be dealt with through proper planning in the early phases of the
project. One example is to have a large meeting where the strategic roadmap is defined
and the common goals are set. At this meeting, all affected employees could discuss
the changes and together find a solution. This might take some time but as soon this is
done, there will be a strong feeling for the project and the project can run faster than it
would without this initial meeting.

During the study some other problems surfaced, that could decrease the possibilities
for a correct analysis. One problem was that some of the empirical data was hard to
interpret and could therefore need a deeper study to find out if the answers given are
the real ones or not. One of these disturbing finding is that the level of IT in the
German companies differ a lot. It might very well be the case that these differences are
real but compared to the Swedish companies the German answers can be found odd.
Almost all of the Swedish companies gave answers that indicate that their IT level is
high or very high.

Another problem with the empirical data is the educational levels in the German
companies. Since only five German companies took part in this study and only three of
them could answer this question, it is hard to draw any conclusions, especially when
the answers vary as much as they did between the German companies. Another study
or further penetration of this question would make any conclusions about the state of
the German educational levels easier and more trustworthy.

Even though there have been problems with this study that would need further
investigation there should be no doubts of the possibilities for Swedish companies to
reach the same, if not better, results than the five German companies in this study
experienced when applying the WAG concept to their companies. To return to the
initial discussion of this study, the one whether there are alternatives to moving abroad
for reaching increased productivity, this study also shows that a concept like the one
Wassermann provides is a very good choice for the companies that want to stay
competitive in Sweden. It has also been shown that companies using the WAG concept
improve their SCM and increase their capital turnover which in turn, as discussed in
the beginning of this study, improves the ROI – a company’s ability to make money.
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GLOSSARY

APS  Advanced Planning and Scheduling
ATP  Available To Promise
BOM  Bill of Material
BPCS  Business Planning and Control System
CASE  Computer Aided Software Engineering
CSCMP  Council of Supply Chain Management Professionals
CSF  Critical Success Factor
EBITDA  Earnings before Interest, Taxes, Depreciation, and Amortization
EDI  Electronic Data Interchange
ERP  Enterprise Resource Planning
ERP II  Extended Enterprise Resource Planning
FCP  Finite Capacity Planning
GDP  Gross Domestic Product
ICT  Information and Communication Technology
IND  Individuality Index
IT  Information Technology
JIT  Just In Time
KPI  Key Performance Index
MAS  Masculinity Index
MIS  Management Information System
MRP  Materials Requirements Planning
MRP II  Manufacturing Resource Planning
NPI  New-Product Introduction
NRI  Networked Readiness Index
OTIFEF  On Time, In Full, Error Free
PDI  Power Distance Index
ROI  Return on Investment
SAP  Systeme, Anwendungen, Produkte in der Datenverarbeitungen
SCH  Supply Chain History
SCX  Supply Chain Excellence
SCM  Supply Chain Management
SCOR  Supply Chain Operations Reference model
UAI  Uncertainty Avoidance Index
WAG  Wassermann AG
APPENDIX A – INTERVIEW GUIDE GERMAN COMPANIES


Ich freue mich auf eine Diskussion der folgenden Themen.

Mit freundlichen Grüßen,
Johan Stéen

Grundlegende Information

- Branche
- Produkten
- Planungs- und Transparenzbedarf
- Angestellte
- Umsatz
- Gewinn
- Marktanteil
- Marktgröße

IT

- IT-Chef
- Dienstleister oder Förderer
- Systemniveau
- Funktionalität
• Lieferant
• IT-Erfahrung im Unternehmen (Jahre, Anzahl Systeme, etc.)
• Sprache

Integration
• Prozesse vs. Funktionelle Organisation
• Querfunktionale Teams
• Maße für Prozessauswertung

Kultur
• Hierarchische/flache Organisation
• Offenheit, Kommunikationswege
• Strukturierte Arbeitsvorgänge
• Datenrichtigkeit
• Förderung von Lernen

Ausbildung
• Ausbildungsniveau (Angestellte und Arbeiter)
• Verständnis von strategischen Zielen
• IT-Verständnis

Veränderung
• Veränderungswille
• Veränderungskultur
• Engagement der Geschäftsleitung
• Strukturierte Projektpläne mit definierten Rollen, Zielen und Verantwortungen

Erlebte Effekte
In folgendem Teil werden die Effekte des WAG-Konzepts durch gewöhnliche KPIs definiert. Die KPIs sind in vier Gruppen eingeteilt: Lieferfähigkeit, Flexibilität, Kosten, und Asset Management.
• Lieferung zur Wunschtermin
• OTIFEF (On Time, In Full, Error Free)
• Prognoserichtigkeit

• Innovationszyklen (Dauer)
• Supply chain response time (siehe Unten)
• Zeitbedarf, die Produktion umzustellen (+/- 20% der Stückzahl)

• Kosten für Auftragsbearbeitungswesen
• Materialbeschaffungskosten
• Lagerhaltungskosten
• Produktionskosten

• Lagerumschlagshäufigkeit (siehe Unten)
• Auslastungsniveau (siehe Unten)

Supply chain response time =
- Tage zwischen Prognoseregenerationen
+ Tage um neue Prognose zur Endproduktstandorten vermitteln
+ Tage um neue Prognose zur internen Lieferanten vermitteln
+ Durchschnittliche Tagen gebraucht um das Produkt zu einkaufen und produzieren (in der Annahme, dass Bestand ist leer)
+ Durchschnittliche Zeit ein Kundenauftrag zu füllen.

Lagerumschlagshäufigkeit = Absatz / durchschnittlicher Lagerbestand
Mit Hilfe dieser Kennziffer wird ermittelt, wie oft der komplette eingelagerte Artikelbestand in einem definierten Zeitraum (üblicherweise 1 Jahr) komplett ausgelagert d. h. verbraucht oder verkauft und durch Neueinlagerungen ersetzt wurde.

Auslastungsniveau =
Die Prozentzahl von verfügbarer Zeit/Ressource die für value adding Aktivitäten genützt werden.


Med vänliga hälsningar,
Johan Stéen

Bakgrundsinformation
I denna del kommer grundläggande information om företaget, dess produkter och marknaden det verkar på att efterfrågas. Viktigt att komma ihåg är att det är endast det egna företaget (en produktionsort) som avses och inte en eventuell större koncern.

- Bransch
- Produkt
- Behov av planering, schemaläggning och transparens
- Antal anställda
- Omsättning
- Vinst
- Marknadsandel
- Marknadsstorlek
IT
Vilken roll som IT spelar i organisationen samt nivån på erfarenheter och kunskaper inom detta område.

- IT-chef
- Tjänstelevererantör eller drivande
- System idag/igår
- Planering
- Funktionalitet
- Leverantörer
- IT-erfarenhet i företaget (antal år och system)
- Språk

Integration
Hur väl ett processtänk är spritt i organisationen samt hur man arbetar över funktions- och företagsgränser.

- Process vs. Funktionell organisation
- Tvärfunktionella team
- Utvärderingsmetoder för processer
- Stöd för integration genom IT

Kultur
Med kultur avses bl.a. struktur, öppenhet och hur lärande hanteras i organisationen

- Hierarki/platt organisation
- Öppenhet, kommunikationsvägar
- Strukturerade arbetsmetoder
- Datakvalitet
- Lärande

Utbildning
Hur utbildningsnivån inom olika områden är i företaget
- Utbildningsnivå (tjänstemän, arbetare)
- Förståelse/spridning av strategiska mål
- Förståelse för IT

**Förändring**

Den sista delen handlar om förändring i företaget

- Förändringsvilja
- Förändringskultur
- Engagemang hos ledningen
- Strukturerade projektplaner med definierade roller, mål och ansvarsområden
APPENDIX C: INTERVIEWEES

WASSERMANN AG

Mayk Beregsasi, Managing Consultant. Wassermann AG. München

Alexander Fink, Managing Consultant. Wassermann AG. München

Axel Flechtenmacher, Managing Consultant. Wassermann AG. München

Karsten Schaaf. Head of Marketing and Production Management divisions. Wassermann AG. München

Andreas Wagner-Manslau, Sales Manager. Wassermann AG. München

RESPONDENTS AT THE STUDIED COMPANIES

Logistics Manager, G1

Process Manager, G2

Process Manager, G3

Production Manager, G4

Logistics Manager, G5

Production Manager, S1

Planning Manager, S2

Logistics Manager, S3

Production Planner, S4

Product Line Manager, S5

Production Planner, S5
Vice President and Production Manager, S6

CEO, S7

Manager, S8

Logistics Manager, S9

Production Planner, S10

Production Technician #1, S10

Production Technician #2, S10