Sales and Operations Planning Framework

How to balance demand and supply for a project-oriented and complex organization operating in the aerospace and defence industry

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Abstract

One challenge organizations are facing in all industries is determining the likely events of the future and developing strategies to handle these challenges. Sales and operations planning are a decision-making process and tool that helps organizations to allocate resources not only to handle the challenges but also to take advantage of future conditions by balancing supply and demand. There is only a limited amount of framework and models available today. This project will divulge and reveal a new framework for sales and operations planning which has been developed in collaboration with an organization operating in the aerospace and defence industry. The basis of the framework consists of a monthly five step process that facilitates the organization in making decisions based on long term (five-years) organizational goals and tying them in with project specific needs. Ultimately, this will provide a centralized system in meeting current project specific demands whilst ensuring future operations are not compromised but enhanced.

The company’s current sales and operations planning maturity level was evaluated and compared to the developed framework to find gaps of what needs to change for the company to have proactive sales and operations planning.

Keywords: Organizational Theory, Sales & Operations Planning, Demand Planning, Supply Planning
Acknowledgement

This thesis project is the final and last part of my five-years of studying. With mixed emotions, I am closing another chapter of my life and I would like to thank my supervisor Martin Kylinger at Linkoping University for his support, understanding, and feedback throughout the project.

I would also like to thank the company I worked with and all the employees who were involved in my research that took the time to answer my questions and helped me along the way.

Finally, I must express my very profound gratitude to my parents and to my boyfriend for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of this thesis project. This accomplishment would not have been possible without them. Thank you.

Linköping, April 2019

Malin Bergstedt
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Abbreviations

A&D          Aerospace and Defence
BOM          Bill of Material
BSC          Balanced Scorecards
CI           Competitive Intelligence
CPOF         Capacity Planning Using Overall Factors
ERP          Enterprise resource planning
IBP          Integrated Business Plan
ILS          Integrated Logistic Support
KPI          Key Performance Indicator
MPC          Manufacturing Planning and Control
MPS          Master Production Schedule
MRO          Maintenance, Repair and Overhaul
MS           Master Schedule
NPD          New Product Development
OCAI         Organizational Culture Assessment Instrument
OL           Business Opportunity
R&D          Research and Development
RCCP         Rough-Cut Capacity Planning
RFID         Radio-Frequency Identification
S&OP         Sales and Operations Planning
1 Introduction

This chapter is describing the problem for a general point of view and what this research will contribute with. It also describes the aim of the research and the research questions that will be answered. The end of the chapter gives the reader an overview of the report in the form of a disposition of the different chapters.

“My interest is in the future because I am going to spend the rest of my life there.” – (C.F. Kettering)

One challenge organizations are facing in all industries is determining the likely events of the future and developing strategies to handle these challenges. A strategy of how to allocate resources not only to handle the challenges but also to take advantage of future conditions is desirable (Geng, 2004). Without the right strategy, organizations are risking getting back orders, dissatisfied customers, excessive inventory stocks, late deliveries, finger pointing, cash-flow problems and, demand and supply out of balance. Unfortunately, it is a norm for many organizations and one reason is because of the different views from stakeholders (Wallace, 2004). The sales department wants increased sales, have more customers and keep a high inventory for fast delivery to satisfy the demand. Operations want the work to be stable and efficient, few changeovers and long running times, the financial department wants high profits with low working capital and the sales department wants to satisfy the customers and keep a high inventory for fast delivery. Operations, finance and sales, all have different views but there is a solution, and the solution is called sales and operations planning (S&OP). (Wallace, 2004)

S&OP also known as aggregated planning is a decision-making process and tool. It is a process that is cheap to implement, and it generates a result within months after implementation and helps the management to free up time to work with opportunities instead of problems. It is a forward-looking process integrating and aligning strategy and tactical views to make cross-functional decisions. Decisions are taken from a financial, operational and process point of view and it creates teamwork among sales, marketing, operations, and product development. (Ptak & Smith, 2011)

The American Production and Inventory Control (APICS) have defined S&OP as:

“A process to develop tactical plans that provide management the ability to strategically direct its businesses to achieve competitive advantage on a continuous basis by integrating customer-focused marketing plans for new and existing products with the management of the supply chain. The process brings together all the plans for the business (sales, marketing, development, manufacturing, sourcing, and financial) into one integrated set of plans.” APICS Dictionary, 14th edition (2014)

The aim of S&OP is to find a balance between demand and supply by generally creating a plan for the next 18-24 months and review the performance from the previous three months. Demand is what the customer wants, and supply is the resources available to meet the demand. The time of planning and reviewing will differ depending on the industry the organization is, but 18-24 months is the general guidelines. (Wallace, 2004)

![Figure 1 - Balance of demand and supply for S&OP (Wallace, 2004, p. 6)](image)

S&OP has been used extensively since its creation in the late 1980s and is today being referred to by many different names including integrated business plan, business planning, integrated business management, integrated performance management, rolling business planning, regional business management, and sales inventory and operations planning (SIOP). Even if it is used consistently there are still a limited number of
Introduction

Frameworks and models. Most organizations partly work with S&OP without knowing that they do. Supply and demand always need to be considered in any organization for it to be profitable and to manage the daily work. (Ptak & Smith, 2011)

Implementing a process that gives result fast and to a low cost have motivated and encouraged many organizations to try, despite the limited frameworks and models, and they also fail (Wallace, 2004). Grimson and Pyke (2007) argue that S&OP is easy to understand but hard to implement and there is no one-fits-all model to use. According to Pedros, Silva, and Tate (2016) the reason why is because of the complexity of S&OP. S&OP is not only a business process, but it also requires the cooperation and company culture to change and the organization needs to work together towards a common goal. Decisions need to be based on what benefits the company as a whole, and S&OP is a process that helps the organization to make choices and decisions from a total business perspective (Wallace, 2004). The processes and tools within S&OP help and supports the management and gives them the confidence to trust their employees to make the right decisions without having to micromanage everything through daylily interference. Everyone in the organization will see the bigger picture and the management can focus on managing and leading the organization in the right direction instead of being a part of the detailed decision making. To build trust to employees, everyone in the organization also needs to share the same values, visions, goals, and objectives. The organization needs to have an effective culture of quality to reach performance excellence and to successfully implement and work with S&OP. A culture where all the company functions actively participate in the S&OP process. (Palmatier, 2002)

S&OP is challenging to implement for any organization but the more complex the organization is, the more difficult is the implementation. Only a limited amount of academic research has been performed on S&OP in complex environments (Pedros et al., 2016). There is a gap of academic research on S&OP within complex environments and industries such as the aerospace and defense (A&D). A&D products range from aircraft, helicopters, ships, and tanks to satellites, space shuttles, missiles, surveillance systems, and radar systems. Within the A&D industry, the demand is affected by geopolitical decisions, congressional spending’s and government regulations and it is rarely sold to individuals. The products are sold to the organizations own military in their own country or other country’s governments. The demand cannot only be based on historical data which makes the forecasting hard and supply needs to be considered long in advance and takes longer to adjust. One inaccurate forecast could be devastating for an organization in the A&D industry. (Safavi, 2005)

This research will contribute to the gap of academic research of S&OP in complex environments, more specifically the A&D industry.

1.1 Problem Description

This thesis project is carried out in collaboration with a company operating in the A&D industry. The company is facing a highly intensive period and its priority is delivery accuracy and customer satisfaction. They have previously had difficulties finishing the project on time and within budget. A consequence is that there are not enough resources for new product developments (NPD), research and development (R&D) and continuous improvement. The A&D industry is uncertain, and their projects are complex, years in duration, and multiple projects are being carried out simultaneously. The different projects have shared resources but there is no system in place today that helps the company to allocate their resources for their different projects. This makes it hard to make the right decision that benefits the company as a whole. There is a lack of communication and trust within the organization and they are experiencing difficulties to balance supply and demand. Based on the fact that the demand is hard to foresee, and the supply is hard to adjust within a short period of time.
1.2 Aim of This Thesis
The aim is to develop a sales and operations planning framework for the company by evaluating current practices at the company with theory.

1.3 Research Questions
In order to reach the aim of the thesis project, the following questions will be answered:

1. How does the company work with sales and operations planning today?
2. What is the ideal framework for sales and operations planning for the company from a theoretical perspective?
3. How does the current state at the company differ from the ideal framework?
4. What actions need to be taken from the company to improve their sales and operations planning based on the findings and result from research question three?

1.4 Delimitations
The name of the organizations will not be mentioned in the report and will only be referred to as the company or the case company, due to security regulations. The company is global and operates in more places than one, but the author has limited the research to just one of their facilities. This thesis project is time limited and the result is only going to be recommendations for the company and will not be implemented during the thesis work.

1.5 Disposition

Chapter 1 – Introduction
This chapter is describing the problem for a general point of view and what this research will contribute with. It also describes the aim of the research and the research questions that will be answered.

Chapter 2 – Methodology
This chapter is presenting the way in which the work was carried out and how the methods contributed to fulfilling the aim of the study and why they were used. The validity and reliability have been analysed to verify the quality of the result.

Chapter 3 – Literature Review
This chapter is presenting the theory which is the foundation of the thesis project.

Chapter 4 – Current State at the Company
This chapter is presenting and describing the case company in more detail and its current state. The organizations dimensions, the structure, culture and processes for sales and operations planning including the demand and supply planning and the maturity of their current sales and operations planning.

Chapter 5 – Sales and Operations Planning Framework
This chapter is presenting a framework developed based on theories, the collected data and with focus on organizations in the A&D industry.

Chapter 6 – Analysis
This chapter is presenting an analysis of the company, the differences between the developed sales and operations planning framework and their current state and how sales and operations planning should be implemented.
Chapter 7 – Discussion
This chapter is presenting analysis and comments about the results and methods used.

Chapter 8 – Conclusion and Recommendation
This chapter is presenting to what extent the aim has been achieved. It contains a summary of the findings and answers the research questions in detail. It also includes recommendations for the company and ideas for future and continued work.
2 Methodology

This chapter is presenting the way in which the work was carried out and how the methods contributed to fulfilling the aim of the study and why they were used. The validity and reliability have been analyzed to verify the quality of the result.

This research project took the form of applied research. Applied research is to seek solutions and improve understandings within a specific area to solve problems for an individual or group (Collis & Hussey, 2013). This research project was applied research based on the fact that it solved a problem for the case company. The way this thesis project was carried out is illustrated in Figure 2. The task was specified together with the case company, based on the knowledge the author had acquired during her university studies. The author then reviewed the literature on the topic agreed upon to get a broader understanding and to gain deeper knowledge. The author defined the scope and the aim of the project together with the case company after acquiring more knowledge within the area, which was summarised into the following four research questions:

1. How does the company work with sales and operations planning today?
2. What is the ideal framework for sales and operations planning for the company from a theoretical perspective?
3. How does the current state at the company differ from the ideal framework?
4. What actions need to be taken from the company to improve their sales and operations planning based on the findings and result from research question three?

The next step was to find, identify and study concepts and theories that could be used to fulfil the aim of the project and that was needed to answer the research questions. The questions were answered in order, from one to four. The knowledge gained from answering one question was then used to answer the next one. The first question required deep knowledge and understanding of S&OP and the case company as an organization. The case company was analysed by studying different dimensions of the organization, structure, culture and their S&OP process used today. Research question two was answered based on the knowledge the author had about the company from answering question number one and literature reviews of S&OP. Question number three was answered by comparing question one and two to find gaps and differences. The last and final question was based on the result from question three and with the help of the studied theory and concepts of how the new framework could be implemented. The theories and concepts that were used are presented in Literature Review. The collected data and review of the company is presented in Current State at the Company. The developed sales and operations planning framework is presented in Sales and Operations Framework and research question three and four is answered in Analysis. The last part before finishing the thesis project was a discussion and reflection about the project and its finding and is presented in Discussion and Conclusion and Recommendations is a summary of the findings, it answers the research questions in detail and includes recommendations for the company of how to improve their S&OP.

Figure 2 - Thesis project process
2.1 Research Approach
This thesis project had both a deductive and inductive approach. The starting point in deductive research is to use already developed theories, then collect data and use the studied theories and apply the data to them. The collected data will then either approve or disapprove with the theory. An inductive approach is the opposite, and the first step is to collect data and then develop own theories based on the data by not using any already established theories. (Björklund & Paulsson, 2014)

This research took a deductive approach at the beginning of the project using already established theories and afterward, data was collected based on the studied theories. In the latter part of the research, an inductive approach was used. Data was collected and based on the collected data, theories in the form of a framework were developed based on the collected data. A truly inductive approach is hard because no already developed theories are used and they are developed by the researcher (Collis & Hussey, 2013). The inductive approach in this research was influenced by what was studied at the beginning of the project and it is not seen as a truly inductive approach, it was a mix between deductive and inductive.

2.2 Research Design
This thesis project was designed as a qualitative research. In a qualitative research the aim is to get a detailed holistic view and it is done by collecting unstructured data in form of words, pictures and objects and to draw subjective conclusions (Björklund & Paulsson, 2014). A qualitative research helped the author to get a holistic view which was necessary in order to develop a framework covering a big part of the organization within a short period of time.

2.3 Case Study
The research strategy that was used for this thesis project was a case study. A case study is a study where the researches aim is to go beyond data and statistical results and get an in-depth understanding. A case study is used to get a complete understanding of the process, program, event or activity, which is defined as the case. It is done by using multiple sources of data. The focus is on qualitative data but both quantitative and qualitative data are used. The case study also has boundaries which would be either time, space or both. (Tellis, 1997)

Yin (1994) identified six sources of evidence to use in case studies:
- Documents
- Archival records
- Interviews
- Direct observations
- Participant-observation
- Physical artifacts

A single embedded case study was used in this research. It is a case study only looking at one case, which in this research is the company and it examines just some aspects of the case which is relevant for the study(Yin, 1994). It was chosen as research strategy because the research questions covered a broad area and in order to answer them the author needed a deep understating of the case.

2.4 Literature Studies
The author early on started with literature studies because the knowledge the author had within the area of S&OP was limited before the research began. The literature study was the foundation of the research and was used to answer the research questions and to give recommendations to the company. All the literature used is referenced at the end of this report, Chapter 9 References. The author has used Access
Methodology

Engineering Library which provides engineering handbooks, Linkoping University Library to search for articles and online books, Google Scholar to find relevant articles and the searching keywords has been: Organizational Theory, Sales & Operations Planning, Demand Planning, Supply Planning, Organizational Culture and Master Scheduling. Addition to this, student literature that has been used in previous subjects undertaken at the university has also been used for this research project.

2.5 Data Collection Method and Tools

The research questions guide the decision of how to design the study and what type of data that needs to be collected (Higgins, Mobley, & Wikoff, 2008). In this thesis project, primary and secondary data have been used. The primary data is the data and information the author collected herself from interviews, observations and surveys. The secondary data is data someone else collected and information that could be found at the company and at the company’s intranet, which is an online page that only employees can access.

2.5.1 Interviews

Interviews are used to get in-depth information (Haeffele, Gardner, & Vogt, 2012). According to Ferris and Martocchio (2003) an interview can be structured, unstructured or semi-structured. A structured interview is standardised with given and fixed questions to ask. An unstructured interview is the opposite to structured. They are unstandardized, informal conversations about a topic which no specific questions. A semi-structured interview is a mix between unstructured and structured. A semi-structured interview is influenced by the interviewee and new questions will be brought up based on what the interviewee says. (Ferris & Martocchio, 2003)

In this thesis project all different interview forms took place. All the interviews are listed below with the role of the person being interviewed, the topic of the interview and what the purpose of the interview was. The result of the interviews is the information found in Chapter 4. Current State at the Company.

Table 1 - Content of interviews at the company

<table>
<thead>
<tr>
<th>ROLE</th>
<th>TOPIC</th>
<th>PURPOSE OF THE INTERVIEW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director of Production Management</td>
<td>Organizational Dimensions</td>
<td>Understand the core process, strategies and goals</td>
</tr>
<tr>
<td>Director of Quality and Environment</td>
<td>Organizational Dimensions</td>
<td>Understand how the daily work is managed, the work with</td>
</tr>
<tr>
<td></td>
<td></td>
<td>continuous improvements and achievement of goals</td>
</tr>
<tr>
<td>Sub-project Manager (R&amp;D)</td>
<td>Organizational Dimensions</td>
<td>Understand the R&amp;D process and the organizational technology</td>
</tr>
<tr>
<td>Director of Program and After Sales</td>
<td>Organizational Dimensions</td>
<td>Understand the organizational structure</td>
</tr>
<tr>
<td>Director of Planning</td>
<td>S&amp;OP Maturity</td>
<td>Understand how demand and supply is balanced and</td>
</tr>
<tr>
<td>Project Manager</td>
<td>Demand and Supply Planning</td>
<td>integrated and the company’s current S&amp;OP level</td>
</tr>
<tr>
<td>Sub-Project Manager (Production)</td>
<td>Demand and Supply Planning</td>
<td>Understand how projects are structured and managed</td>
</tr>
<tr>
<td>Inventory and Storehouse Manager</td>
<td></td>
<td>Understand how resources are managed and gain knowledge of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the resource planning tools</td>
</tr>
<tr>
<td>Director of Production</td>
<td>Demand and Supply Planning</td>
<td>Understand how the production is managed to balance supply and demand</td>
</tr>
</tbody>
</table>
Methodology

| Business Intelligence Manager | Demand Planning | Understand the business intelligence process |

Before each interview, the author used the company’s intranet to find out more specifically what their role meant, their areas of responsibility, delegations and delegation of authority in order to construct the right questions to the right person. The interview regarding the organizations maturity in S&OP was structured with only specific questions to answer and can be found in Appendix 1 – S&OP questions to define the level of maturity. All the other interviews where semi-structured. The author had structured questions prepared before the interview, for the purpose of the interview to be fulfilled, shown in Table 1. The interview then took shape depending on the answers of the interviewee. The unstructured interviews have been performed continuously during the project. Conversations with employees in varies areas and departments with no specific questions and were used to get an understanding of the daily work within the organization and inputs about the organizational culture.

2.5.2 Observations

The observations that have been made are observations of the day-to-day work. In order to get an understanding of the culture and the people within the organization. The author did also participate in a few meetings and the purpose was to see how meetings where constructed and what was discussed. The knowledge gained from the observations was only for the author’s own use to get a more comprehensive understanding of the organization and the complex internal processes.

2.5.3 Surveys

A survey is a questionnaire with structured questions and short-answers (Haefele, Gardner, & Vogt, 2012). The author constructed a survey to understand the culture within the organization. It was based on the organizational culture assessment instrument (OCAI) developed by Robert Quinn and Kim Cameron. The survey consisted of six different questions of how they see the culture today and how they would prefer the culture to be, related to the department they work in. The survey was handed out in paper form to employees in varies areas within the company and to people in different hierarchy positions to get a broad overview and different opinions. The different departments were: Production, Engineering and Integrated Logistic Support (ILS), Quality and Environment, Program, Procurement and Finance. In total, 26 people answered the survey.

The survey is attached in Appendix 2 – Culture survey, and the result of the survey is presented in Chapter 4.3 Organizational Culture and a more detailed result from the different departments is attached in Appendix 3 - Result from surveys about the company culture.

2.5.4 Internal Company Restricted Documents

The author has used secondary data from the company’s intranet. Documents that describe their processes, policies, regulations, structure, strategies and goals. The author used these as a compliment to interviews. Even if the documents did describe the processes the author got a deeper and better understanding with the help of interviews.

2.6 Validity and Reliability

The author has justified the research validity by using multiple sources of information and references proving the same thing. Yin (1994) highlights the importance of not letting “subjective” judgments affect the collection of data. To avoid subjective judgments the supervisor from both the university and the company continuously reviewed the work and the progress made. Reliability is to prove that if the research would be repeated, the outcome would be the same (Yin, 1994). The reliability has been proven with a detailed methodology describing the different steps of the project. This makes it possible for readers to understand the work in detail and makes it possible to repeat the same project and the outcome would be the same result.
2.7 Ethics and Anonymity

All the interviews have been anonymous to make sure that the interviewees feel comfortable discussing any areas of their concern and problems they are experiencing within the organization at the time. The surveys were anonymous to make sure that everyone was honest with their answers without having to worry that they would get questioned or confronted afterwards.
3 Literature Review

This chapter is presenting the theory which is the foundation of the thesis project.

“Essentially, all models are wrong, but some are useful.” – George E.P Box (1987)

3.1 Organizational Theory

Draft (2009) have defined organizations as social entities that are goal-directed, designed as deliberately structured, coordinated activity systems which are linked and adapted to the external environment. Organizations consist of system of relationships that direct and allocate resources and are made up of people and their relationships with one another to serve a useful purpose (Keller & Pyzdek, 2013; Daft, 2009). Draft (2009) have summarized why organizations exists with seven key points, see Figure 3.

![Organizations exist to do the following:](image)

To understand and evaluate an organization, one must understand its dimensions. With an understanding for the organization, the organization can achieve high performance and effectiveness (Doty, Glick, & Huber, 1993; Ganco, Hinings, & Van de Ven, 2013; Daft, 2009). Organizational dimensions are divided into structural and contextual, providing information that goes beyond what a casual observer can see. The structural dimensions of an organization are the internal factors characterizing the organization and the contextual dimensions refer to the whole organization (Daft, 2009). Draft (2009) describes the dimensions as followed:

**Structural dimensions**

- **Formalization** is the amount of documentation the organization has including procedures, job descriptions, regulations and policy manuals.
- **Specialization** also called division of labour is to what extent the tasks are divided into separate jobs and the range of jobs the employees perform.
- **Hierarchy of authority** shows the span of control for the organization and who reports to whom.
- **Centralization** is to what hierarchical level the employees can make organizational decisions.
- **Professionalism** is the level of education and training required from employees.
- **Personnel ratio** is the number of employees in one profession divided by the total number of employees in the organization (Daft, 2009, pp. 15-17)
Contextual dimensions

Size measured in number of employees.

Organizational technology is the tools, techniques and actions the organization is using to produce the products or services.

The environment refers to elements outside the organizations boundary’s such as stakeholders.

Goals and strategy of the organization defines the purpose. The strategy is a set of plans to reach the goal and this defines the scope of the operations and relationship with stakeholders.

Organizational culture is the underlying set of key values shared by all employees in the organization (Daft, 2009, pp. 17-18)

3.1.1 Organizational Strategy and Goals

A strategy is a plan of how the organization will reach their goals. The choice of goals and strategies influence the way the organization should be designed and determines the overall success of the organization (Hamel & Prahalad, 2005; Daft, 2009). Figure 4 shows an illustration of the relationship through which top management decides on the strategy and the design of the organization. The first step is getting inputs from the internal situation and the external environment. Accessing and evaluating external opportunities, threats, including uncertainties and resource availability and defining the internal strengths and weaknesses. This gives the organization an understanding for where the organization stands in relation to its competitors. (Daft, 2009) A company’s product development and improvement initiatives need to be connected to its strategy and the strategy needs to be directly connected to the company’s goals (Palmatier, 2002).

The strategic intent is a fit between the internal situation and the external environment (Hamel & Prahalad, 2005). The strategic intent is the overall mission and official goals defined by the top management (Daft, 2009). The aim is not to find a niche within an existing market but to create opportunities that are suitable for the own organization based on its internal situation. It envisions a desired future position that is stable over time (Hamel & Prahalad, 2005). Management then formulates operational goals and strategies of how the organization will success to reach the overall mission. Operational goals are on a more comprehensive level and helps to give employees a sense of direction (Daft, 2009). Draft (2009) have defined six different operational goals:

- **Overall performance** reflected in profitability e.g. net income, earning per share, return on investment, growth and output volume.
- **Resources** are the ability to obtain needed material and financial resources.
- **Market** in form of market shares or the decried market standing.
- **Employee development** with training, promotions, safety and growth of employees.
- **Productivity** is the ratio of output to inputs.
- **Innovation and Change** is the ability for the organization to adapt to changes and be flexible and the development of new services and products.

The overall mission defines why the organization exists and describes their shared values and believes (Daft, 2009). The organizational goals are set as targets that require personal effort and commitment (Hamel & Prahalad, 2005). The organization design reflects the implementation of the strategies and how the goals will be reached. The organization design is the structural form within the organization, decisions about information and control systems, production technology, human resource policy, culture and inter-organizational linkages. Most organizations already have a defined design before setting a strategic intent and would need to redesign the organisation to successfully implement a new strategy and goals (Daft, 2009).
Effectiveness outcome is the last step where the management measure the success of the company and how well the goals were met. It is important that the knowledge gained is fed back to the internal situation to learn from past performances. (Daft, 2009)

Figure 4 - The top managers provide direction and evaluate the effectiveness of organizational efforts (Daft, 2009, p. 59)

3.1.2 Organizational Structure and Design

The organizational structure defines the formal reporting relationship within the organization with levels of hierarchy and departments with groups of individuals and is reflected in an organization chart. The chart is a visual diagram showing the underlying activities and processes in the organization. The organizational structure is designed to ensure that communication and coordination works throughout the organization (Daft, 2009). The structure of an organization is designed to ensure that processes align with strategic objectives (Boutros & Purdie, 2014). It also needs to fit in with the contingency factors of the environment, size, life cycle, technology and culture, illustrated in Figure 5 (Daft, 2009). The structure consists of two elements and it is vertical and horizontal integration. The vertical integration is the formal reporting relationships and the grouping together of individuals. The horizontal integration is the relationship across departments (Daft, Murphy, & Willmott, 2014).

Figure 5 - The right mix of design characteristics fits the contingency factors (Daft, 2009, p. 74)
There are no one-size fits-all organizational structures. Two different views of organizations are the traditional (mechanistic) organization and one with focus on learning (organic). A traditional organization emphasize on vertical communication and control were as a learning organization emphasizes on communication and collaboration. For decision makings an organization is designed as centralized or decentralized. In a centralized organization the top level makes the decisions and in a decentralized organization, authority is shared between departments and the organization share tasks and the decision making. (Daft et al., 2014)

Vertical and horizontal information sharing helps organizations to facilitate the communication between departments and employees. Vertical linkages represent the communication and coordination between the top and bottom of an organization and are used for control. The horizontal linkages are the communication and coordination across the departments (Daft, 2009). Daft et al., (2014) have defined a variety of vertical and horizontal linkages for an organization to use to achieve good communication and coordination:

**Vertical Linkages**

- **Hierarchical referral**: Vertical chains of command. When employees encounter a problem they cannot solve, it is transferred to the next level in the hierarchy and then back when solved.
- **Rules**: With the use of repeating tasks and standard procedures employees can act without approval or direct communication with managers.
- **Plans**: Provide guidance for employees e.g. budget and annual objectives.
- **Vertical information systems**: Include progress reports, written communication and online communication to managers. (Daft et al., 2014)

**Horizontal Linkages**

- **Information system**: Information exchange for e.g. progress, problems, activities, risks and opportunities.
- **Direct contact**: For top level managers or employees effected by a problem. One strategy is to have a person (liaison) working with direct communication between two departments.
- **Task forces**: Temporary committee of representative from each department.
- **Full-time integrator**: Delegated position/department for coordination.
- **Teams**: Project teams that are permanent task forces. (Daft et al., 2014)

The most commonly used organizational structures are function, projectized and matrix’s organizations (Boutros & Purdie, 2014; DeFeo & Juran, 2014). A function organization focuses on similar processes and departments are grouped together based on specialized expertise top level down and is used when the organization only has one or a few products. Each department has a functional manager that manages their individual departments. It is a simple structure with clear responsibilities and with a well-defined management hierarchy. One of the cones is that it creates barriers for the communication between the departments and has slow decision-making processes. Project managers have a little or no formal authority and must compete over the resources for their projects and the organization has a restricted view of their goals. (DeFeo & Juran, 2014)
An alternative to a functional organization is a projectized (horizontal) structure. The structure is defined based on specific projects which is the opposite of a functional structure. The employees develop loyalty to the projects and the project manager because they have the authority instead of the functional department. The communication between departments is strong and the structure makes the organization flexible with fast decision-making processes. (DeFeo & Juran, 2014) A projectized organization puts limits on functional skills and expertise within departments and it is difficult to identify the core processes within the organization (Daft, 2009).

A matrix organization is defined as weak, balanced or strong and it is a combination of both the functional and projectized organization structure. The matrix structure has shown to be successful for organizations conducting large, cross-functional projects. (Keller & Pyzdek, 2013)

In a matrix organizational structure, the employees report to one functional manager and at least one product manager. In a weak matrix the project manager only has a limited amount of authority and only a part-time role and works more as a coordinator and organizational structure is close to a functional. In a balanced matrix the responsibility and power are shared between the functional manager and the project manager. In a strong organizational structure, the project managers have a full time roll and they get supported by project administrators which are not fully dedicated to the project. The pros of a matrix organization are that it has visible project objectives and improves the project management control over
resources, but it requires extra administration and is more complex to monitor and control. (DeFeo & Juran, 2014)

![Matrix Organization Structure](image)

**Figure 8 - Illustration of a matrix organizational structure (Daft, 2009, p. 111)**

### 3.1.3 Organizational Culture

An organization is a society which consists of habits and believes and is held together by shared values. The culture is the values and behaviours that contribute to the environment of the organization. (DeFeo & Juran, 2014; Daft, 2009). Many agree that the organizational culture determines the success of the organization and that a more effective culture pays off (Franchetti, 2009; Boutros & Kendall, 2016; DeFeo & Juran, 2014). According to Bodinson and Kendall (2016) “an organization’s culture is the engine that drives the strategy”.

Organizational culture assessment instrument (OCAI) is a tool and research method developed by Robert Quinn and Kim Cameron to access and evaluate the organizational culture, both its current and preferred situation. The OCAI consists of four competing values (stability, flexibility, internal and external) that correspond with four different types of organizational cultures. (Heritage, Pollock, & Roberts, 2014) Figure 9 is an illustration of the OCAI framework. The four different cultures are:

- **Clan Culture** is held together by its members, much like an extended family. The working environment is friendly and nice, where the members of the organization share personal information and they feel comfortable in each other’s presents. It is driven by teamwork, open communication and personal development. Its members are highly dedicated, and the management works as mentors, like a father figure and everyone is highly dedicated and loyal to their organization and its members. (Heritage et al., 2014)

- **Adhocracy Culture** focuses on creativity, to always be the leading organization in the industry with new unique products and service. Its members are not afraid to take risks, it is event encouraged by the management. The management are innovators that reinforce new standards and continuous improvements to find creative solutions to make sure they are always on the front edge. (Heritage et al., 2014)
Hierarchy Culture is a very structured environment with formal rules and policies that need to be followed, because it is what keeps the organization together. Managements operates as coordinators and supervisors to make sure the organization is well managed and that the structure is kept. Focus is on stability and punctuality and the processes are continually measured to keep control and problem-solving are done systematically. (Heritage et al., 2014)

Market Culture is goal-oriented with the main priority to get the job done. The success of the company is what drives the organization. Everyone is goal oriented and everyone strives to win, and it is what keeps the organization together, the common goal of winning and being the best. The management controls the organization with a hard hand and pushes its members to achieve its goals. (Heritage et al., 2014)

![Factor structure of the OCAI reflective of the competing values framework](Heritage, Pollock, & Roberts, 2014, p. 2)

3.1.4 Culture Change

The organizational culture is hard to change but even harder to sustain and the capability of an organization to change is determined by its adaptive characteristics. The adaptive cultures characteristics are customer-focused, proactive, taking intelligent risks, quick and smoothly information flows, local decision-making and high creativity. (Miller, Villafuerte, & Wroblewski, 2014)

The ability for an organization to adapt to changes and work with continuous improvements is determined by the organizational culture (Franchetti, 2009). Dr. Juran and The Juran Institute have developed a model called the Juran Transformation Model which consists of five organizational breakthroughs that must change for an organization to transform and sustain the transformation (DeFeo & Juran, 2014):

1. Leadership and management
2. Organization and structure
3. Current performance
4. Culture
5. Adaptability

Each breakthrough in the Juran Transformation Model is a subsystem in the organization that must change to achieve performance excellence and gain an effective culture of quality and to stay that way (DeFeo & Juran, 2014).
Leadership and management
The management needs to set performance goals to give guidance for the employee of where to go. The goals need to be clearly communicated to employees and it is important that everyone understands the goals and agrees. The management needs to motivate people in the organization and act as leaders by showing the way and not by being cheerleaders. All employees need to know what is expected of them and how their work contributes to the overall success of the company and how it is measured. (DeFeo & Juran, 2014)

A performance review is ways of helping employees reach their goals. The review should be done on a regular basis and the aim is to let the employees know what they are doing right and what needs to be improved. It is an opportunity for the management to help the employees learn from the past and set new goals. (Poole, 2013) If counterproductive behaviour or conflicts arises there needs to be guidelines of how to make decisions based on the situation to solve the problem as quick and smooth as possible (DeFeo & Juran, 2014).

Organization and structure
The formal reporting relationship within the organization with levels of hierarchy and departments with groups of individuals. The organizational structure represents the most effective and efficient way the organization needs to be designed in order to work towards their goals. (DeFeo & Juran, 2014) This is further described in 3.1.2 Organizational Structure and Design.

Current performance
The organization needs to have a system in place and a routine of how to handle things that are wrong with products, services or processes, and the associated customer dissatisfaction and high costs. How to reduce or eliminate waste e.g. defects, delays, unnecessary costs and prevent the same problems from happening again by finding the root cause and eliminating it. (DeFeo & Juran, 2014)

Culture
The organizational culture represents the social climate that encourages organization members to align and work together toward the organization’s performance goals. The first step for the management is to review the vision, mission and values and make sure that all employees are engaged and involved. (DeFeo & Juran, 2014)

Studies have showed that the engagement from employees have a heavy correlation with the revenue of the organization and the engagement is influence from the very first start, when getting hired. Organizations with highly engaged employees have more than double the revenue compared to similar organizations with less engaged employees (Poole, 2013). A result of working with continual improvement processes in the organization creates a habit of improvement in the organization and is a part of the culture but DeFeo and Juran (2014) have further defined issues that must be addressed before the culture change is sustainable:

- Orientation of new employees and training practices
- Reward and recognition of policies and practices
- Human resource policies and administration
- Quality and customer satisfaction policies
- Fanatic commitment to customers and their satisfaction
- Commitment to continuous improvement
- Standards and conduct codes, including ethics
- No "sacred cows" regarding people, practices, and core business content
Adaptability
The adaptability is the last of the five breakthroughs presented in the Juran Transformation Model and cannot be applied until the previous four are accomplished. The success and survival for all organizations depend on its ability to adapt and react to threats and opportunities (DeFeo & Juran, 2014). Barnard and DeFeo (2004) have developed a cycle called the adaptive cycle shown in Figure 10. The cycles show how the information from the external and internal environment is gathered, processes, interoperated, evaluated and how actions are taken. The work with the adaptive cycle never stops. The environmental conditions are changing, and so needs the organization. It is important to always give feedback, and lesson learned after decisions have been made to learn from the experience.

![Adaptive Cycle](image1)

Figure 10 - Adaptive cycle (Barnard & DeFeo, 2004, p. 291)

3.2 Sales and Operations Planning
S&OP is a process described as organized common sense (Patak & Smith, 2011; Palmatier, 2002). It is a management process helping organizations to manage their business and balance demand and supply for all the management functions. It is a decision-making process for supply, demand, product development and resources required to satisfy customers’ expectations at all times. For the best decisions to be made in the process, the best available information needs to be provided to the right people at all times (Wallace, 2004; Pedros, Silva, & Tate, 2016; Palmatier, 2002). In order for S&OP to work, demand and supply needs to be decoupled and considered separately, see Figure 11. It enables organizations to not force demand to conform to the production level (Palmatier, 2002).

![Decoupling of demand and supply](image2)

Figure 11 - Decoupling of demand and supply (Palmatier, 2002, p. 122)
**Literature Review**

In S&OP, process, people and tools all need to work together and overlap. People need to have the right knowledge, be trained, understand what is expected of them and work according to principles, policies and procedures. The process is a defined way of operating and working with process steps, inputs, outputs, measurements and defined roles and responsibilities within the organization. The tools, also referred to as technology is what people need to be able to work according to the process e.g. software and manuals. Palmatier (2002) have defined a management principle based on three knobs that is used to balance: process, people and tools. The three knobs are work, resources and time which the management have the responsibility to control. One can never only change one of the knobs without adjusting and twisting at least one of the others. The work is what must be done including volume and scope. The resources are what is needed to perform the work e.g. people and material. The time is when the work is performed and completed and illustrated in a schedule. (Palmatier, 2002)

![Figure 12 - Business excellence elements for S&OP (Palmatier, 2002, p. 72)](image)

The S&OP process is described as a five-step process by multiple authors, where sales, marketing and manufacturing once a month agree on the set of numbers for sales, production and inventory (Boutros & Purdie, 2014; Wallace, 2004; Pedros et al., 2016; Palmatier, 2002). All business functions need to be involved in the S&OP process, including managers in charge of finance, human resources, marketing, materials, operations, product management and sales (Palmatier, 2002). The models and the name of the procedures might differ slightly but essentially, they all describe the same process. One of the models called the Kodiak Model created by Oliver Wright is illustrated in a cycle, shown in Figure 13.

![Figure 13 - The monthly S&OP process cycle (Palmatier, 2002, p. 83)](image)
The cycle consists of a product review, demand review, supply review, financial review and an S&OP meeting. They are all separate subsystems which are performed separately and in order. The S&OP process have an executive owner, but each subsystem is also a process and requires a process owner who is at a management level. Some organizations also decide to assign a coordinator to each subsystem, depending on how big and complex the organization is. The reviews are functional management meetings and are held monthly where anyone who wants to can attend but it is important that the key people are there who will be affected by the outcome of the meeting. The processes focus is the future, but the future is often influenced by the past. All the sub-processes need to follow the basis practices, showed in Figure 14.

Figure 14 - Basis practices for subsystems within S&OP (Palmatier, 2002, p. 126)

**Step 1 – Product Review**
The first step in the S&OP process is the product review. It includes updating systems and files with the most recent information of actual sales, inventory, production, sales and marketing and all other relevant information (Wallace, 2006). In order to understand what products will be available to sell and when. Doing this by agreeing on existing and new product development (NPD), forecast, priorities for product development, and update schedules and timetables to making sure the projects stay within time and budget. The outputs from this process are an update of product development and launch plans and anticipated product end-of-life plans. (Palmatier, 2002)

Figure 15 - Input for the product review (Palmatier, 2002, p. 246)

**Step 2 – Demand Review**
The demand review is an integrated sale and marketing planning or replanning process. It includes all areas that could or will influence and affect the demand and NPD is one of the key demand drivers. The data gathered from step one is used to review the forecast and to create a final demand forecast. The final
Literature Review

demand forecast is an unconstraint plan of what to sell and what the organization is committed to selling in volume and value including the assumptions that have been made. Even if the plan is unconstrained, it needs to be realistic. The plan is based on the fact that all of the organization’s resources are available. The output is an aggregate and detailed forecast used for master scheduling. It is seen as a request of resources or capacity to meet the market demand. (Palmatier, 2002)

Palmatier (2002) believes that the employees closest to the customer and the market have the most knowledge about what the customer wants and suggests that they should be responsible for the forecasting and also be the owner of the demand review process. The demand review also needs to be coordinated which the help of a full-time working demand review coordinator. The S&OP process is done monthly but there will be times when this would have to be done more than on a monthly basis and the plan always needs to be communicated to supply. (Palmatier, 2002; Wallace 2006) This is covered in more depth later in 3.3 Demand Planning.

Step 3 – Supply Review
The demand review for key functions in supply and is seen as a request of products which the supply review need to make sure there is supply for. That the customer demands, timeframe and inventory targets are met and also review past performance from what was planned to take learnings from and to identify root causes of performance variance in order to prevent it from occurring again. An example is illustrated in Figure 16, of how the past performance can be measured for the supply review process. The result from the three past months are reviewed and categorised as green, yellow or red to illustrate the result. Green meaning that the result was good, yellow that the result was almost met and red that it was not met. (Palmatier, 2002)

![Supply Measurements Table](image)

Figure 16 - Supply review performance measurements (Palmatier, 2002, p. 117)

After reviewing the performance, the supply review needs to look at the new demand plan developed in the demand review and determine if the plan can be met with the resources available and within the projected cost. The objective is to review the demand plan, compare it to the demonstrated capacity, make a rough-cut capacity analysis and use the three-knob principle (work, time, resources) to adjust the resources according to the demand plan. (Palmatier, 2002) This is covered in more depth later in 3.4 Supply Planning.

Step 4 – Financial Review
The financial review is the development of the resulting project pro-forma financials across the planning horizon which is a minimum of 18 months. The financial review process also needs a process owner, like the demand and supply review. The process owner of the financial review has a coordinator that is participating during both the demand and supply review meetings. The tasks for the coordinator during the demand review are to make sure that the projected pricing is discussed and agreed upon. In the supply review the coordinator needs to make sure that projected cost issues are discussed and agreed upon. The financial coordinator does not have the authority to make decisions during these meeting, only to question and challenge issues that may arise concerning finance and costs. The coordinator keeps the process owner informed of upcoming issues and major changes based on the decisions made at the review meetings. Based on the quantitative data from the demand and supply review the coordinator develops a pro-forma income statement, balance sheet and cash flow analysis. The financial review process also includes the development of a month-by-month financial projection to demonstrate any changes to the plan. The
financial review does not necessarily need a meeting, but the information and result needs to be communicated to cooperate. (Palmatier, 2002)

**Step 5 – S&OP Meeting**

When all the above sub process is done, the final step is the S&OP meeting (Boutros & Purdie, 2014; Wallace, 2004; Palmatier, 2002). This is not a meeting for discussions, it is a meeting where recommendations are reviewed, and decisions are made and that is why it is important that people with authority to make those decisions attend (Wallace, 2006; Palmatier, 2002). During the S&OP meeting they must agree and approve the S&OP plan and if needed, adjust and afterwards finalize and release the plan (Palmatier, 2002). Organizations need to develop their own standard meeting agenda that suits their organization and needs, but they should answer the following questions (Palmatier, 2002):

1. What have changes since last month?
2. Are we on plan financially?
3. How are we performing to our company goals and key performance indicators?
4. What new or different risks do we need to understand or consider?
5. What decisions need to be made or approved in this S&OP cycle?
6. What decisions will we be compelled to make within the next few months?
7. How are the individual product families or product groupings performed?
8. Are we on schedule, on cost, on scope with our product development efforts?
9. How are we performing to the company initiatives? Are we on scope, on schedule, on cost?
10. Do we have any resource constraints, and how well are we utilizing our key resources?
11. Are we comfortable with the plan across the entire planning horizon?
12. Is there any reason to revisit our strategic plans or company goals?
13. What did we do well in this cycle of S&OP? What might we improve?

![Figure 17 - S&OP executive meeting agenda (Palmatier, 2002, p. 151)](image)

**3.2.1 Integration and Implementation**

A successfully implemented S&OP is a demand-and strategy-driven process and is developed from what the organization wants to accomplish in the marketplace. It enables the organization to say yes to business opportunities. S&OP integrates the management at all levels, vertically and horizontally with an integrated plan. (Palmatier, 2002) Thomé et al., (2012) developed a framework for S&OP with four key elements, context, input, structure and process and outcomes, based on research synthesis. It shows the integration between S&OP and the business plan with annual goals and budgets, and the corporate strategy plan. The framework describes the process but does not describe how it should be implemented, see Figure 18. People, processes and tools all needs to be integrated but the mind-set of the people should be the main focus. Open and honest communication needs to be encouraged and not “shooting the messenger” when bad news is brought up. This is why the company culture has a big effect on the S&OP and its performance. The main focus with S&OP is on the mind-set of people. The management need to have the fundamental principles shown in Figure 19. (Palmatier, 2002)
According to Ptak and Smith (2011) all organizations need to have their own customized approach to S&OP but one principle that remains constant for all organizations is that S&OP needs to show return within the first six months for it to be successful. A long implementation is expensive and the longer it takes the more benefits will be lost and management will lose interest if it does not show result fast enough. When the first S&OP process cycle is up and running, illustrated in Figure 13, only a few products and product families will be included. The purpose of the first cycle’s is to work as a test for the process design, find sources of information and for the organization to develop a standardized information presentation and learn by doing. The rest of the products will be added on in future cycles. A successful and effective implementation is done in four steps (Palmatier, 2002):

1. Education
2. Process design
3. Getting started
4. Learn by doing
Focus is on getting everyone involved and making sure everyone understands what the organization is doing (Palmatier, 2002).

Figure 20 - Implementation approach for S&OP (Palmatier, 2002, p. 218)

S&OP changes the way the work is done and the way the organization communicates and how they deal with issues that have not been dealt with before. It changes the way the business is managed. Figure 21 shows the full implementation of S&OP. Even if the organization can see progress and result only after a few months, the whole implementation takes 12-24 months. Improved communication is step number one and after that, the organization can start with problem solving. When implementing S&OP, issues may arise to the surface, which the organization was unaware of. Once the communication is improved and there is a problem-solving approach, the problems can be prevented by identifying them, prioritize solutions and eliminate constraints. (Palmatier, 2002)

Figure 21 - Four phases of implementation (Palmatier, 2002, p. 224)

3.2.2 Maturity Model

A maturity model is used as an integration framework for organizations to evaluate their current S&OP process and it provides a vision of a future state of what could be accomplished. It helps to identify specific actions that need to be taken to move to a more advanced process. The maturity model is represented in a one to five ranking and with five dimensions. The five rankings are the levels of maturity, ranging from no S&OP to a proactive stage when meetings are event-driven, plans and software is fully integrated within the organization with suppliers and customers and it is the optimal level the organization can achieve in a foreseeable future. The five different dimensions are meetings & collaboration, organization, measurements, which are primarily business processes, information technology and the S&OP plan integration. (Grimson & Pyke, 2007)
### Table 2 - S&OP Maturity Model (Grimson & Pyke, 2007, p. 330)

<table>
<thead>
<tr>
<th>Meetings &amp; Collaboration</th>
<th>Stage 1 No S&amp;OP Processes</th>
<th>Stage 2 Reactive</th>
<th>Stage 3 Standard</th>
<th>Stage 4 Advanced</th>
<th>Stage 5 Proactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Silo Culture</td>
<td>• Discussed at top level management meetings</td>
<td>• Staff Pre-Meetings</td>
<td>• Supplier &amp; customer data incorporated</td>
<td>• Event driven meetings supersede scheduled meetings</td>
<td></td>
</tr>
<tr>
<td>• No meetings</td>
<td>• Focus on financial goals</td>
<td>• Executive S&amp;OP Meetings</td>
<td>• Supplies &amp; customers participate in parts of meetings</td>
<td>• Real-time access to external data</td>
<td></td>
</tr>
<tr>
<td>• No collaboration</td>
<td></td>
<td>• Some supplier / customer data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Supplier &amp; customer data incorporated</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Organization</th>
<th>Stage 1 No S&amp;OP organization</th>
<th>Stage 2 Reactive</th>
<th>Stage 3 Standard</th>
<th>Stage 4 Advanced</th>
<th>Stage 5 Proactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>• No S&amp;OP function</td>
<td>• No formal S&amp;OP function</td>
<td>• S&amp;OP function is part of other position: Product Manager, Supply Chain Manager</td>
<td>• Formal S&amp;OP team</td>
<td>• Throughout the organization, S&amp;OP is understood as a tool for optimizing company profit.</td>
<td></td>
</tr>
<tr>
<td>• Components of S&amp;OP are in other positions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Executions are discussed at top level management meetings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Focus on financial goals</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Stage 1 No measurements</th>
<th>Stage 2 Reactive</th>
<th>Stage 3 Standard</th>
<th>Stage 4 Advanced</th>
<th>Stage 5 Proactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Measure how well Operations meets the sales plan</td>
<td>• Stage 2 plus:</td>
<td>• Sales measured on forecast accuracy</td>
<td>• Stage 3 plus:</td>
<td>• Company profitability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Stage 2 plus:</td>
<td>• New Product Introduction</td>
<td>• S&amp;OP effectiveness</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Information Technology</th>
<th>Stage 1 No measurements</th>
<th>Stage 2 Reactive</th>
<th>Stage 3 Standard</th>
<th>Stage 4 Advanced</th>
<th>Stage 5 Proactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Individual managers keep own spreadsheets</td>
<td>• Many spreadsheets</td>
<td>• Centralized information</td>
<td>• Batch process</td>
<td>• Integrated S&amp;OP optimization software</td>
<td></td>
</tr>
<tr>
<td>• No consolidation of information</td>
<td>• Some consolidation, but done manually</td>
<td>• Revenue or operations planning software</td>
<td>• Revenue &amp; operations optimization software – link to ERP but not jointly optimized</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Revenue or operations planning software</td>
<td>• S&amp;OP workbench</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Revenue &amp; operations optimization software – link to ERP but not jointly optimized</td>
<td>• Real-time solver</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Batch process</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S&amp;OP Plan Integration</th>
<th>Stage 1 No formal planning</th>
<th>Stage 2 Reactive</th>
<th>Stage 3 Standard</th>
<th>Stage 4 Advanced</th>
<th>Stage 5 Proactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Operations attempts to meet incoming orders</td>
<td>• Sales plan drives Operations</td>
<td>• Some plan integration</td>
<td>• Plans highly integrated</td>
<td>• Seamless integration of plans</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Top-down process</td>
<td>• Sequential process in one direction only</td>
<td>• Concurrent &amp; collaborative process</td>
<td>• Process focuses on profit optimization for whole company</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Capacity utilization dynamics ignored</td>
<td>• Bottom up plans - tempered by business goals</td>
<td>• Constraints applied in both directions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 3.2.3 Scenario Planning

Scenario planning is used for an effective S&OP and is an integrated part of the S&OP process. Scenarios are required to support decision making under uncertainty. Instead of predicting the one future that could occur, scenario planning considers multiple possible futures all at once. It is based on the idea that organizations are better at preparing then predicting, because there is no way of knowing exactly what is going to happen in the future. Scenario planning is about preparing for multiple potential futures and developing a plan of what should be done today, based on the possible futures that could happen. There are an unlimited number of possible futures and scenarios that could happen, and the key is to create 2-4 different scenarios that together capture the most relevant uncertainties and driving factors and face the most relevant apects. (Coates, 2016)
Pabla (2011) have defined the process for scenario planning:

1. Review and summarize existing and current conditions
2. Collect data that supports the conditions
3. Prepare at least two scenarios
4. Unfold the story for each scenario
5. Discussions the scenarios and use brainstorming in e.g. seminar/conference/group/committee
6. Implementation of an action plan for today and how to deal with the scenarios in the future

Safavi (2005) has summarized irregular events and scenarios that would affect the demand for organizations in the A&D industry:

- War and deployment of troops may boost demand
- Extreme weather may accelerate corrosion, and thereby shorten the life expectancy of parts
- Manufacturing defects may lead to unexpected failure
- Poor engineering design may lead to a higher rate of failure
- Disasters such as 9/11 or Space Shuttle crash may significantly impact demand (p. 4)

### 3.2.4 Performance Measurements

Performance measurements measure the effectiveness of the S&OP process (Palmatier, 2002; Boutros & Purdie, 2014). It is an ongoing process of measuring how well or, how poorly the organization is performing (Boutros & Purdie, 2014). Research has shown that it fundamentally improves performance in the organization because it measures past performances which provide a statistical basis for confidence or concern and it motivates people to work harder (Palmatier, 2002). DeFeo and Juran (2010) have defined why it is important for organizations to measure performance:

- To know to what degree, the objectives and goals have been accomplished
- To monitor continuous improvements
- To know how individuals, teams and business units are performing

For people to be motivated, they need to know how they contribute to the success of the company (Myerson, 2012). According to Sandholm (1999), three criteria’s needs to be fulfilled in order to give employees the right pre-conditions to do a good job.

1. The employees need to know what he or she is meant to do
2. The employees need to be able to affect the result of their work
3. The employees need to know the result of their work

### Key Performance Indicator

Key performance indicators (KPI) measure the sub goals which is broken down from the organization’s overall goals. KPI’s measures and helps to monitor the performance against plans. They need to include customer concerns, be easy to obtain on a timely basis, identify chronic waste or cost of poor quality, and be linked to the strategic goals in the organization. (DeFeo & Juran, 2010) It is important that the organizations KPI’s are aligned, and that departments measure the same thing because they are working towards a common goal (Palmatier, 2002).

KPI’s needs to be easy to understand, be measured with a purpose and it needs to be clear what is being measured and how it is being measured and holistically integrated into the organization model. (Higgins, Mobley, & Wikoff, 2008). Higgins et al., (2008) have defined requirements that are needed for good KPI’s:
Literature Review

Title. Explaining what is measured and why.
Purpose. Specifying the underlying logical basis of the measure.
Relates to. What business objective it related to.
Target. Targets of the KPI to evaluate the level of performance.
Formula. Measure the performance in the right way because it affects how people behave.
Frequency of measurement. When it is measured, based on the volume of data available.
Frequency of review. How often it is reviewed.
Who measures. One person is responsible for the collection and reporting of the data.
Source of data. Consistent source of data is critical.
Who owns the measure. Each KPI needs to have an owner.

Balanced Scorecard

Balanced scorecards (BSC) is a strategic performance management tool (Geng, 2004). The BSC considers multiple stakeholders and helps the organization to reach a long-term success (Palmatier, 2002). It gives the management a balanced look at measured key results in the organization (Myerson, 2012) by looking at the organization from four different perspectives (Myerson, 2012; Geng, 2004):

1. **Financial**—How should we appear to our shareholders to succeed financially?
2. **Customer**—How should we appear to our customers to achieve our vision?
3. **Internal business processes**—What business process must we excel and what could we be best at to satisfy our stakeholders?
4. **Learning and growth**—How can we sustain and improve our ability to change with the help people, skills, training, knowledge and leadership to achieve our vision?

A small number of strategic objectives are set for each of the perspectives. A target will then be set for each strategic objective that it can be measured against on a regular basis to decide success or failure. It can be measured with either leading or trailing measures and there should only be a few measurements that are easy to understand and that can be acted upon fast. The trailing measurements are easy to measure, and they are accurate and give the answer if there has been a success or not. The leading measurement is the only one that can be influenced, but they are hard to identify. It is always better to focus on a small number of things that will influence change rather than so many that nothing gets achieved at all. (Geng, 2004)

Paltimier (2002) have developed a scorecard that can be used to measure the S&OP process, shown in Table 3. It includes the product, demand, supply and financial review, market measurements and an overview of the effectiveness of the S&OP. It measures the performance from the three previous months. Green meaning that the targets where met, yellow, that they were almost met and red, that they were not met. (Paltimier, 2002)
3.2.5 RACI Method

The RACI Method is a system chart that shows the four levels of involvement in decisions. It is used to identify the people who will best contribute to the decisions made and decide how they can work together. The method describes who is involved in what activities and how they are involved. It creates a contract of responsibility and prevents confusions, misunderstanding and cuts across the politics and cultural obstacles in the organization. The levels of involvement are (Brue, 2006):

- **Responsible** — The person who is assigned to do the work and contribute as much as possible
- **Accountable** — The person who is responsible and makes the final decision
- **Consulted** — The person who need to be consulted before a decision is made because they have expertise in the area, or they exercise some authority
- **Informed** — The person whom the decision will affect and who therefore need to be notified a decision have been made or action has been taken

### Table 3 - Balanced scorecard for S&OP (Palmatier, 2002, p. 98)

<table>
<thead>
<tr>
<th>Sales and Operations Planning</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was everyone prepared?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Were the right people present?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was the information at the right level of detail?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Were the needed decisions made?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did we make efficient use of our time?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can we improve the S&amp;OP process?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Financials</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT ($)</td>
<td>Red</td>
<td>Yellow</td>
<td>Green</td>
</tr>
<tr>
<td>Sales revenue to plan ($)</td>
<td>Green</td>
<td>Green</td>
<td>Yellow</td>
</tr>
<tr>
<td>Margin % to plan</td>
<td>Green</td>
<td>Green</td>
<td>Yellow</td>
</tr>
<tr>
<td>Operating expenses to budget ($)</td>
<td>Green</td>
<td>Green</td>
<td>Yellow</td>
</tr>
<tr>
<td>Cost drivers</td>
<td>Green</td>
<td>Yellow</td>
<td>Red</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supply</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing revenue to plan</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
<tr>
<td>Inventory value ($) and turns</td>
<td>Green</td>
<td>Green</td>
<td>Yellow</td>
</tr>
<tr>
<td>Supplier quality performance</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
<tr>
<td>Initial test yields ($)</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
<tr>
<td>Cycle times (days)</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
<tr>
<td>Inventory record accuracy (%)</td>
<td>Green</td>
<td>Yellow</td>
<td>Yellow</td>
</tr>
<tr>
<td>Production plan vs. actual (%)</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td>Master schedule performance (%)</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td>Master schedule stability (weekly)</td>
<td>Green</td>
<td>Yellow</td>
<td>Red</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Products</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>New product introduction on-time performance (%)</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td>Cycle time to first customer prototype</td>
<td>Green</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Cycle time to safety approval</td>
<td>Yellow</td>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td>Average cycle time</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td>Project development costs</td>
<td>Green</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Development resource load to capacity ratio</td>
<td>Yellow</td>
<td>Red</td>
<td>Red</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Demand</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Forecast vs. actual by subfamily (units and %)</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Yellow</td>
</tr>
<tr>
<td>Forecast vs. actual by top 30 sku mix</td>
<td>Green</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Inventory performance by customer group</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
<tr>
<td>On-time customer service performance (%)</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
<tr>
<td>Bookings activity</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
<tr>
<td>Past due customer orders</td>
<td>Green</td>
<td>Yellow</td>
<td>Yellow</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Markets</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total market forecast accuracy</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
<tr>
<td>Market #1 market share</td>
<td>Green</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Market #2 market share</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
<tr>
<td>Competitive portfolio positioning</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
</tbody>
</table>
Demand management is crucial for S&OP based on the fact that it is a demand driven process. Demand management is an integrated marketing and sales management process. (Palmatier, 2002) Kottler (1999) have defined demand management as:

“Marketing’s main thrust and skill is demand management, namely, to influence the level, timing and composition of demand in pursuit of company objectives” (p.17).

Paltimer (2002) have described the demand management process with a cycle, illustrated in Figure 23. Focus in this project is on step number one, demand planning.

Demand planning include all areas that could or will affect the demand for products or services, which is all marketing and sales activities (Palmatier, 2002). It has previously been referred to as forecasting but from the development of S&OP organizations are coming to the conclusion that forecasting is a method used trying to predict the future and it is not good enough, (Palmatier, 2002; Ptak & Smith, 2011) because a forecast is always wrong (Wallace, 2006). Today there is new and better ways to make more educated predictions, by using cross-functional views when planning demand (Ptak & Smith, 2011). The demand planning for S&OP should be an unconstrained plan assuming that all resources are available, this will later be reviewed when planning the supply (Palmatier, 2002). Palmatier (2002) describes a best practice for quality demand planning with a jigsaw puzzle where all the pieces are a key to have a successful demand planning shown in Figure 24.

Process – There needs to be a process in place to regularly and routinely handle and make updates of the demand plan. The demand plan consists of orders that have been received and orders that are expected to
come and it should be handled as a natural part of the workload. It is done to ensure that the organization always have the best information available at all times. (Palmatier, 2002)

**Attention** – The demand panning process needs attention on an ongoing basis, making sure the demand plan is updated on a detailed level. (Palmatier, 2002)

**Multiple Views** – Getting multiple views and perspectives from individuals is a way to get a more accurate demand plan, it is also referred to as consensus forecasting or collaborate forecasting when customers are involved and gives inputs. When taking multiple views into consideration it is important to document and communicate the assumptions that have been made and occurrences. (Palmatier, 2002)

**Collaboration** – Establishing close relationships with customers and suppliers and work together to develop product forecasts (Palmatier, 2002).

**Customer Linking** – An automated communication with suppliers and customers helps organizations to build stronger relationships to their customers. It replaces the traditional order entry process and is used to communicate forecasts, firm commitments and lead times. For project-oriented companies, it is used to communicate the project schedule. (Palmatier, 2002)

**Measurement** – The only way of knowing if something is improving is to measure it. Demand planning is a process and its inputs and outputs could be measured to minimize inaccuracy. (Palmatier, 2002)

The horizon for how long the demand planning needs to be depends on the type of industry but a long-term demand planning should never be on a detailed level. It needs to be on an aggregated level because a detailed level requires a lot of effort but will not improve accuracy (Grimson & Pyke, 2007). This project is focusing on the A&D industry, which is make-to-order, meaning that there are no finished goods in inventory. (Safavi, 2005). Demand planning for companies building to customer orders needs to focus on the projected backlog of orders to ensure that the delivery times are met (Stahl & Wallace, 2008). Stahl and Wallace (2008) have defined three distinct time zones for the backlog for companies building to customer order. The three zones are: the sold zone containing only sold orders, the partial zone containing some sold orders and some forecasts, and the last zone is the unsold zone, containing only forecasts. In the sold zone, the already sold customer orders needs to be confirmed or adjusted. The partial zone needs inputs from e.g. quote activities and active projects to confirm and adjust the orders and forecasts. The unsold zone needs to make forecasts of orders and the volumes expected to be received.

The demand for A&D products is low based on the fact that customers only buy a small number of products and the products go through multiple engineering changes during its lifespan. This means that maintenance, repair and overhaul (MRO) is crucial for companies operating in this industry. There are two types of MRO demand: parts that are replaced during maintenance and parts that fail randomly during
usage. The more accurate the historical data is the higher quality the statistical demand forecast is for MRO. There is also critical to do long-range forecasts before making R&D investments for NPD. It can only be done when knowing the size of the market, market shares and drivers of demand. (Safavi, 2005)

Safavi (2005) have defined five areas that are challenges companies in the A&D industry needs to overcome to reach a world-class forecasting:

1. **Available and Reliable Data** – Historical data needs to be properly collected at the point of use and used for future event visibility. With the help of radio-frequency identification (RFID) technology, the quality of the data would improve significantly.

2. **Right Forecasting Model** – The statistical forecasting models needs to be chosen with care because it determines the forecast accuracy.

3. **Customer Collaboration** – A close collaboration with suppliers gives the company insights in their growth plan, new deployment plans or any experience they might have had with part failures.

4. **Sales and Operations Planning Process** – There needs to be an integrated process with demand forecasting, routines of measuring the performance against what was planned. What sales and operations planning are, have been covered in Chapter 3.2 Sales and Operations Planning.

5. **Measurement of Forecast Error** – Routinely measure forecast errors to find the root cause of the inaccurate forecast and make improvement.

### 3.4 Supply Planning

Supply planning is a forward-looking process and a part of S&OP. The objectives are to make decisions on how to meet the future demand with supply, in the best possible way while talking financial and business goals into consideration. (Jacobs, Berry, Whybark & Vollmann, 2011)

#### 3.4.1 Rough-Cut Capacity Planning

Rough-Cut Capacity Planning (RCCP) is preformed monthly and on an aggregated level. RCCP is a simulation of capacity and determines if the demand plan developed in the S&OP process is feasible and if there is enough supply to support the demand. It included the key work centres or resources required to get the job done. The key resources are the resources most likely to cause problems, which is difficult or expensive to change e.g. skills, materials, engineering or money, and if they are the right “size”, decide if the organization can commit and support the demand plan. If not, the organization needs to solve the out of balance condition by adjusting one or more of the three knobs (work, resources and time), mentioned in Chapter 3.2 Sales and Operations Planning. RCCP is not only used to identify problems but is also used to find opportunities and see where there is available capacity. (Palmatier, 2002; Jacobs, Berry, Whybark & Vollmann, 2011)

The key resources are not only used to support the demand plan. They are also needed for the organizations work with projects for product development and company improvement initiatives. An aggregated source management process is critical for the management to identify, priorities and provide resources to support the demand plan but also projects for product development and improvement initiatives within the company. (Palmatier, 2002)
Jacobs et al., (2011) have defined three different RCCP techniques:

1. Capacity planning using overall factors
2. Capacity Bills
3. Resource Profiles

**Capacity planning using overall factors (CPOF)** is a simple method based on accounting data and overall historical ratio of work between work centres. The method can only be used if the historical divisions of the work between the different work centres and the product mix remain constant. The input data comes from the master production schedule (MPS). The first step is to calculate the capacity requirements for the overall plant to meet the demand. The overall labor-or machine-hour capacity requirements is estimated and based on the historical data received from the MPS. The second step is to allocate the total capacity required in each period to individual work centres. The allocation of work is done by using historical ratios from prior periods to estimate the anticipated direct labor-or machine-hours for each work centre. (Jacobs et al., 2011)

**Capacity Bills** requires detailed product information and compared to the CPOF method; capacity bills take shifts in the product mix into account. Capacity bills show the total time required to produce one product for each work centre. The first step is to look at the product structure, the bill of material (BOM) of the product. By using outing data and direct labor-hour or machine-hour data from MPS, the estimated capacity requirements for individual work centres can be calculated. Once the bill of capacity for each product is done, MPS is used to estimate the capacity requirements for each individual work centre. (Jacobs, et.al, 2011)

**Resource profiles** is a time-phased projection of the capacity requirements for individual production facilities based on capacity requirements and lead times by using BOM, routing, time standard information and lead time. (Jacobs, et.al, 2011)

### 3.5 Master Scheduling

The master scheduling (MS) is a presentation of the demand, including forecast and the backlog, the master production schedule (MPS), the projected-on hand (POH) inventory and the available-to-promise (APT) quantity. The MPS is the primary output of the master scheduling process. The MS process connects the decisions made in S&OP to the supply chain and is interfaced with sales, marketing, engineering, finance, materials, manufacturing and transportation. The monthly S&OP plan needs to be communicated and put into the MS (Proud, 2007; Jacobs et al., 2011)

The American Production and Inventory Control (APICS) have defined MS and MPS as:

“The master schedule is a format that includes time periods (dates), the forecast, customer orders, projected available balance, available-to-promise, and the master production schedule. The master schedule takes into account the forecast; the production plan; and other important considerations such as backlog, availability of material, availability of capacity, and management policies and goals.” APICS Dictionary, 11th edition (2005)

(1) “The master production schedule is a line on the master schedule grid that reflects the anticipated build schedule of those items assigned to the master scheduler. The master scheduler maintains this schedule, and in turn, it becomes a set of planning numbers that drives material requirements planning. It represents what the company plans to produce expressed in specific configurations, quantities, and dates. The master production schedule is not a sales item forecast that represents a statement of demand. The master production schedule must take into account the forecast, the production plan, and other important considerations such as backlog, availability of material, availability of capacity, management policy and goals”. APICS Dictionary, 11th edition (2005)
MS is a key link in the process of balancing supply and demand, see Figure 25. MS contributes to keeping the schedule firm within a fixed and agreed upon timeframe. The output of the MS is a detailed plan for material and capacity to meet the requirements from the S&OP with the resources available. The objective is to deploy people, equipment, material and capital in the most efficient way possible. (Proud, 2007)

Figure 25 - Master scheduling in the process of balancing supply and demand (Proud, 2007, p. 34)
4 Current State at the Company

This chapter is presenting and describing the case company in more detail and its current state. The organizations dimensions, the structure, culture and processes for sales and operations planning including the demand and supply planning and the maturity of their current sales and operations planning.

4.1 Dimensions of the Organization

It is a global company operating in the A&D industry. They deliver a full range of products and services for air, land and naval forces, as well as advanced electronics, security, information technology solutions and support services. They design, integrate and support weapon systems for forces around the world.

4.1.1 Structural Dimensions

**Formalization** - All the employees have access to the company’s regulations and policies via the company’s intranet and they also get an introduction of it when they first get hired. Procedures and job descriptions for each role can also be accessed online. The employees can sort all documents related to their position to get an overview of what documents apply to their role. The procedures to follow when working varies for different jobs and positions, some departments have strict processes to follow where as others have the freedom to construct the job after what they think is best to achieve the objectives.

**Specialization** - The company requires that employees have a deep knowledge within their area of expertise and therefore the range of jobs employees perform is very limited.

**Hierarchy of authority** - Who reports to who is defined by the organizational structure and is explained further in Chapter 4.2 Organizational Structure. Employees report to two people, the functional manager and the project managers. At the company’s intranet, for each employee it states what authority they have and what decisions they are authorised to take. There are also documents describing what responsibility employees have in their position.

**Centralization** - The company is decentralized, and business decisions are taken by the top management.

**Professionalism** - When new employees are hired the company makes sure that have the right education and competence for the job and afterwards it is up the functional manager, who manages the department to make sure that their employees get continuous education within their area based on what is need for them to perform their job as good as possible.

**Personnel ratio** - Figure 26 is an illustration of the different departments and the ratio. The category other includes managers, HR, procurement, finance, quality and environment.

![Personnel ratio](image)

*Figure 26 - Mix of Employees (Company Intranet, 2018)*

4.1.2 Contextual Dimensions

**Size** – The company have around 330 employees and are constantly expanding.

**Organizational technology** - They do not manufacture anything on their own. Everything is produced and manufactured by subcontractors and other suppliers. The core process within the company is described in Figure 27. The briefcase consists of products that are always available for purchasing. Every single product that has ever been made is still available, but it is only the processes for the products in the briefcase that
**Current State at the Company**

are maintained and can be manufactured without any reconstructions or changes. Marketing and sales work with their current customers and with trying to find new business opportunities and new customers. The products from the briefcase are adjusted after the customer’s unique requirements. When a product is sold and delivered to the customer the revenue is put back into the company and towards R&D and NPD. The result is a different briefcase of products that can be offered to customers.

![Figure 27 - The core process within the company (Company Intranet, 2018)](image)

**The environment** - In the A&D industry there are a lot of stakeholders that are affected or can be affected by the company’s actions. The stakeholders for the case company are:

- Employees
- Interest Groups
- Customers
- Owners
- State and Community
- Lenders
- Suppliers

**Goals and strategy** - Each year the management sets a number of strategies for the organization based on their vision. The strategies are long term goals that they want to achieve on a high level, referring to the whole organization and specific strategies for their products. The strategies are then further broken down into plans of actions covering a five-year period. The action plans are distributed throughout the organization and to the different departments for them to individually develop their own strategies and goals based on the overall strategies and what is applicable to their division. The planning and development of the new strategy begins at the end of each year. The finalized strategies lay the ground for their five-year budget plan of how many resources to allocate to each department for each year. When the five-year plan is defined and finalized, a detailed one-year budget is then set for the coming year. The one-year budget is what controls and regulates the organization throughout the year. The follow-up of the organizations targets, and measurements is done in the following areas: finance, quality, security, safety, working environment and external environment. An example of the finance follow-up is illustrated in Table 4. Where the value of order received, and sales is measures against what was planned and the actual outcome over four periods within a year.
Table 4 - Follow-up of financial goals and targets (Company Intranet, 2018)

<table>
<thead>
<tr>
<th>Value of Orders Received</th>
<th>Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MSEK</strong></td>
<td><strong>MSEK</strong></td>
</tr>
<tr>
<td>Period 1</td>
<td>Period 1</td>
</tr>
<tr>
<td>Actual</td>
<td>Planned</td>
</tr>
<tr>
<td>Period 2</td>
<td>Period 2</td>
</tr>
<tr>
<td>Actual</td>
<td>Planned</td>
</tr>
<tr>
<td>Period 3</td>
<td>Period 3</td>
</tr>
<tr>
<td>Actual</td>
<td>Planned</td>
</tr>
<tr>
<td>Period 4</td>
<td>Period 4</td>
</tr>
<tr>
<td>Actual</td>
<td>Planned</td>
</tr>
</tbody>
</table>

**Organizational culture** - The culture is department dependent and there is no general culture for the overall organization. This is further described in Chapter 4.3 Organizational Culture.

### 4.2 Organizational Structure

The company have a functional organizational structure were employees are grouped together based on specialized expertise, the structure is illustrated in Figure 28. The actual work is performed and done in projects, one of the company’s project structures is shown in Figure 29. Project managers must compete for resources for their project and it is the managing director from each department’s responsibility to supply each project with the right people, the right knowledge and competence. The managing director of the department answers question regarding who should be in the project and how they should contribute. The project manager is responsible and in charge of what is done and when it is done. This means that each employee answers to two people. The managing director for their department and the project manager for the project they are working in. In total today, there is in-between 65-70 projects going on simultaneously but only five of these are big projects. If it is a big project, employees usually work full time on that specific project, but it all depends on the size of the project. A lot of employees are used as shared resources and they work with multiple projects.

![Organizational structure at the company](Company Intranet, 2018)
Current State at the Company

The project structure illustrated in Figure 29 shows how one of the company's bigger projects are structured. The project structure is functional, same as for the whole company. The executive team works full time on the project and the other resources are used when needed and they work in multiple projects.

To transfer information from the different projects to the management they have five counsels that work cross-functional in the organization. The counsels deal with questions regarding finance, quality, safety, processes, and the environment. The counsels make sure that regulations are followed and that the company meets the requirements of their certifications. They also plan, set targets and specify measurements within their area, including setting priorities that ensure a holistic view.

4.3 Organizational Culture

According to the company their culture builds on trust, innovation and boldness and it lays the ground for all their decisions. This is the top management’s view of the culture but to get a deeper understanding and a broader view of the culture the author constructed surveys, attached in Appendix 2. The surveys were based on the organizational culture assessment instrument (OCAI) developed by Robert Quinn and Kim Cameron. It determines what competitive values the organization has, and it defines what type of culture they have, clan, adhocracy, hierarchy, market culture or a mix between them.

The survey was handed out in paper form to employees in various departments and people in different hierarchy positions to get a broad overview and different opinions. The different departments were: Production, Engineering and ILS, Quality and Environment, Program, Procurement and Finance. The author herself also answered the survey to get a visual image of how she sees the culture. The authors own view of the culture is shown in Figure 30. It shows that she sees the company’s culture as a clan culture. Where the working environment is friendly, its member’s share information and feel comfortable in each other’s present. It is driven by teamwork and the employees are highly dedicated. When looking at the
summarized data for all departments, the result shows something different. It is a big variance in response from all departments. People within the same department have answered the questions similar to each other but when looking at the differences in departments, it is far from the same.

A summary of the result and the different departments is attached in Appendix 3, showing how they see the culture today in their department and how they would prefer the culture to be. Looking at the result and the views of the culture from different departments it is not possible to draw any conclusions about the overall culture. The culture varies in all departments. The current culture for one department could be the preferred culture of another. Overall all departments except for production wishes to have a more clan-oriented culture. The author’s view of the culture correlates to the way the production department sees the current culture. This is a summary of the different department’s view of the current and preferred culture:

The production department sees the organizational culture as a strong clan culture where the working environment is friendly, and they feel like they are a part of an extended family and the management style in the organization is characterized by teamwork. They do want to keep the clan culture but not as strong as it is today. They prefer a more hierarchy culture with formal rules and policies to follow, to keep the organization together with stability and processes that are continually measured to keep control and perform problem-solving systematically. They are missing coordinating and organized leadership that strives for smooth-running efficiency.

The engineering and ILS department see the organization as a mix between all different cultures, clan, adhocracy, hierarchy and market culture but mostly a market culture. A culture where they are goal oriented and everyone strives to win, and the management is pushing its members towards achieving their goals. The difference between the current and preferred culture is that they want less focus on goals and a stronger clan and adhocracy culture. A clan culture with more emphasize on human development and an organization with high trust and openness between employees and more teamwork. Where the organization is coordinated and organized for a smooth-running efficiency. They also prefer a more adhocracy culture that emphasis on being on the cutting edge where trying new things are valued and that more people are willing to take risks.

The quality and environment department see the organization as mostly a market culture but with influences from the other cultures. They prefer a stronger clan culture. Where the leadership is characterised by coordinating and organizing for smooth running efficiency and a more controlled and structured workplace. With employees that have a high level of commitment to the organization. They think it should be less focus on goals and hitting targets on the marketplace and instead focus on human developments.
Current State at the Company

The program department sees the organization as a strong hierarchy culture. They consider the organization to be a very controlled and structured place. Procedures generally control what people do and the leadership in the organization is considered to amplify coordination for smooth-running efficiency and the organizations success is defined by its efficiency. They prefer a stronger clan culture instead of hierarchy. With a leadership that is characterised by mentoring and a management style consisting of teamwork. The success of the organization should be defined more on the development of human resources and employee’s commitment which should build on high trust and openness.

The procurement department sees the organization as hierarchy, adhocracy and market culture. Where the leadership have a result-oriented focus and success is defines by having the most unique and newest products. They consider the workplace to be structured and where procedures generally control what people do. They would prefer a more clan-oriented culture that builds on high trust and openness towards each other. With a leadership considered to exemplify monitoring, a management style that is characterized by teamwork and that the organization should emphasizes its success on human development.

The finance department sees the organization as a mix between all the four different cultures where no culture stands out. They think that hitting targets and winning the market place is dominant. The leadership is considered to exemplify coordinating and organizing for smooth-running efficiency and that people are committed to the organization and individuals are not afraid to take risks. The finance department prefer a more clan-oriented culture. The management style should be more characterised by teamwork and that loyalty and mutual trust should hold the organization together. The finance department think that the organization should emphasises their strategy more on human development and the organizations success should be defined by the development of human resources, teamwork and employee’s commitment.

4.4  Sales and Operations Planning

The company works according to a process called integrated business planning (IBP). Oliver Wight (2018), have described IBP as a further development and evaluation of S&OP and is described as an advance S&OP process. The focus of IBP is on growing the business in ways that benefit all stakeholders in the supply chain (Oliver Wight, 2018). The company’s IBP is a central part of their operational framework and strategy management. The IBP comprises a strategic plan and a financial forecast for the current financial year and financial projections for the next five-years. The IBP process is divided into two phases, IBP1 and IBP2.

IBP1 is the strategic phases were the integrated business plan is developed. It is a broad assessment of the organizations current strategic and financial position on the marketplace. The IBP1 process starts at the end of each year and it includes developments of strategies and plans based on past results, demand and the visions and strategies set by the top management. The IBP2 process starts when phase one is complete, which is half way through the year and continues until the end of the year and all the company’s departments are a part of this phase. IBP2 is an evaluation of the options or actions identified in phase one. In phase two, a detailed strategic and financial five-year plan is set, reviewed and approved. It includes key assumptions that have been made and identified major business milestones. The targets and goals are modified into actual numbers that can be measured and analysed. A detailed IBP sets the basis and foundation for the coming financial year. The company’s work with IBP is a yearly cycle and once phase two is done, the work of developing phase one starts again, the IBP process is illustrated in Figure 31.
4.4.1 Demand Planning

Customers buy products from their briefcase and they are customized according to the customer’s requirements. The company invests in R&D and NPD projects to upgrade their existing products and to develop new products. They also have customers who order an upgrade on the products they have already purchased or spare parts if something is broken or outdated. The company have a list called the Business Opportunity List (OL), which is a summary of identified business opportunities. The opportunities are reviewed and if it is practicable, it is moved to what is called the FABO-list. The FABO list consists of four different categories of business opportunities:

- Follow-up
- Actual
- Back-up
- Opportunity

The FABO-list is updated four times a year for the whole IBP process, which is five-years and monthly for the current financial year. The list is what lays the ground for the coming five-year period and the IBP. The follow-up and actual orders are used for resource allocation and are fully planned for. The likelihood of getting these orders is considered to be more than 40 percent. For back-up orders, resources are allocated to some extent and the purpose of back-up orders is to replace actual orders in case they are not received. The likelihood of getting back-up orders is at least 10 percent. The opportunity orders show where there are possibilities, but they are uncertain, or the company does not have the right prerequisites or enough resources to accept these orders. The inputs for business opportunities are quotations from the customer, information acquired from collaboration and communication with customers or through competitive intelligence (CI) management.

CI management is a structured process for monitoring, collecting, analysing and processing relevant information about the outside world for decision making. Information related to all aspects of the surrounding business environment, directly or indirectly, is expected to affect short and long-term competitiveness and market attractiveness for the organization. CI supports the strategically, tactical and operational decisions. The goal of environmental monitoring is to continuously:

- Identify needs and gather relevant CI information
- Analyse, delineate and compile conclusions based on the CI
- Communicate and implement decision-making based on CI information
- Evaluate and improve the business benefit of the CI

CI management includes five different areas: media, market, government, equipment/technology and method. The company has a person responsible for each focus area and they have the freedom to decide themselves how they want to perform their work. All people working with CI have regular meetings, but
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Official meetings must be at least quarterly, and they report yearly as a part of the IBP process to the top management.

4.4.2 Supply Planning

When the company plans a project, it is an unconstrained plan and the assumption is made that all resources are available, and they use backwards planning. The project start date is based on when the project needs to be finished and delivered. The company does not manufacture anything by themselves and therefore the employees is their most important and critical resource. Customers also order spare parts and they are bought from suppliers, controlled, repacked and shipped to the customer. The most frequent parts that are ordered are kept in storage for a faster delivery to their customers. They also keep material and smaller parts that are not order specific in storage and available for all projects to use, e.g. tools, screws, nuts and bolts.

What resources are needed is determined by the demand and the FABO-list. The resources required are summarized and a plausibility assessment is made. The available resources are then prioritized and allocated to the different projects.

The business-management software they are using today is called IFS. A snapshot of the capacity planning for two different work-centres from IFS is shown in Figure 32. The graphs show the number of hours per week that is firm planned and released for that specific work-centre. The light green colour represents the firm planned orders. The yellow colour represents the firm planned orders over capacity. The dark green colour is the released orders and the red is the released orders over capacity.

![Figure 32 - Snapshot of the company's capacity planning from their business-management software](image)

4.4.3 Sales and Operations Planning Maturity

The company’s current S&OP process maturity level is showed in Table 5, marked with yellow. Four out of five dimensions is on stage two, which is reactive, except for S&OP plan integration which is on a standard level. The questions that were used for the structured interview, to define the maturity level of their S&OP process are attached in Appendix 1.
### Current State at the Company

Table 5 - The Company’s S&OP maturity level (Grimson & Pyke, 2007, p. 330)

<table>
<thead>
<tr>
<th>Meetings &amp; Collaboration</th>
<th>Stage 1 No S&amp;OP Processes</th>
<th>Stage 2 Reactive</th>
<th>Stage 3 Standard</th>
<th>Stage 4 Advanced</th>
<th>Stage 5 Proactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Silo Culture</td>
<td>• Discussed at top level management meetings</td>
<td>• Staff Pre-Meetings</td>
<td>• Supplier &amp; customer data incorporated</td>
<td>• Event driven meetings supersede scheduled meetings</td>
<td>• Real-time access to external data</td>
</tr>
<tr>
<td>• No meetings</td>
<td>• Focus on financial goals</td>
<td>• Executive S&amp;OP Meetings</td>
<td>• Suppliers &amp; customers participate in parts of meetings</td>
<td>• Throughout the organization, S&amp;OP is understood as a tool for optimizing company profit.</td>
<td></td>
</tr>
<tr>
<td>• No collaboration</td>
<td></td>
<td>• Some supplier / customer data</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Organization</th>
<th>Stage 1 No S&amp;OP organization</th>
<th>Stage 2 Reactive</th>
<th>Stage 3 Standard</th>
<th>Stage 4 Advanced</th>
<th>Stage 5 Proactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>• No S&amp;OP function</td>
<td>• S&amp;OP function is part of other position: Product Manager, Supply Chain Manager</td>
<td>• Stage 2 plus: Sales measured on forecast accuracy</td>
<td>• Stage 3 plus: New Product Introduction</td>
<td>• Stage 4 plus: Company profitability</td>
<td>• Formal S&amp;OP team</td>
</tr>
<tr>
<td>• Components of S&amp;OP are in other positions</td>
<td>• Financial or operations planning software</td>
<td>• S&amp;OP effectiveness</td>
<td>• Executive participation</td>
<td>• Integrated S&amp;OP optimization software</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Stage 1 No measurements</th>
<th>Stage 2 Reactive</th>
<th>Stage 3 Standard</th>
<th>Stage 4 Advanced</th>
<th>Stage 5 Proactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>• No measurements</td>
<td>• Measure how well Operations meets the sales plan</td>
<td>• Stage 2 plus: Sales measured on forecast accuracy</td>
<td>• Stage 3 plus: New Product Introduction</td>
<td>• Stage 4 plus: Company profitability</td>
<td>• Stage 4 plus: Company profitability</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Information Technology</th>
<th>Stage 1 No consolidation of information</th>
<th>Stage 2 Reactive</th>
<th>Stage 3 Standard</th>
<th>Stage 4 Advanced</th>
<th>Stage 5 Proactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Individual managers keep own spreadsheets</td>
<td>• Many spreadsheets</td>
<td>• Centralized information</td>
<td>• Batch process</td>
<td>• Integrated S&amp;OP optimization software</td>
<td></td>
</tr>
<tr>
<td>• No consolidation of information</td>
<td>• Some consolidation, but done manually</td>
<td>• Revenue or operations planning software</td>
<td>• Revenue &amp; operations optimization software – link to ERP but not jointly optimized</td>
<td>• Full interface with ERP, accounting, forecasting</td>
<td>• Real-time solver</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S&amp;OP Plan Integration</th>
<th>Stage 1 No formal planning</th>
<th>Stage 2 Reactive</th>
<th>Stage 3 Standard</th>
<th>Stage 4 Advanced</th>
<th>Stage 5 Proactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Operations attempts to meet incoming orders</td>
<td>• Sales plan drives Operations</td>
<td>• Some plan integration</td>
<td>• Plans highly integrated</td>
<td>• Seamless integration of plans</td>
<td>• Process focuses on profit optimization for whole company</td>
</tr>
<tr>
<td></td>
<td>• Top-down process</td>
<td>• Sequential process in one direction only</td>
<td>• Concurrent &amp; collaborative process</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Capacity utilization dynamics ignored</td>
<td>• Bottom up plans - tempered by business goals</td>
<td>• Constraints applied in both directions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The answers to the questions 1-10, defining the level of S&OP maturity, attached in Appendix 1:

(1) The company is using a mix between a top down and bottom up approach when forecasting demand. They are using a top down approach when looking at the overall market to identify targets and to find business opportunities. The people involved are people working with CI management and the marketing and sales department, but the final decisions are made by the top management. Information is also collected from collaboration and communication with suppliers. The collaboration with customers varies. In some cases, customers only contact the company when something is broken, and it needs to be replaced and for others the communication is continuous. The bottom up approach is used for the demand planning of project. Projects define an
unconstrained demand plan of what is needed to execute the project and it covers the whole project period and the project manager is responsible.

The forecasting is a part of the IBP process and is done on a detailed level for the coming financial year and over a five-year period but with fewer details. The whole IBP process takes a year to develop and finalize. There are processes in place of how to update the demand forecast. It is supposed to be updated quarterly for the whole five-year period and once a month for the coming financial year, but it is not done, at least not monthly. The bigger projects do a monthly review and update their demand plan, but it is not done for all projects and all the demand plans are not summarized to get a holistic view. The demand forecast, and planning is done on spreadsheets in excel.

(2) The managing director for each department is responsible to report how many employees they have, who is available and who works within which project. The available material and what are in storage is documented in IFS on a regular basis. The company does not manufacture anything in-house and they are heavily dependent on their suppliers to deliver the parts on time, but the suppliers are usually only involved if problems are encountered. The managing director must also review the demand plan if it is reasonable and if there are enough resources to support the demand.

(3) The projects have meetings weekly and monthly, and they must report to the top management. The project manager gives the top management an overview of the timeplan for the project on a detailed level, presenting demand and supply and highlights if supply is missing. The top management takes decisions on moving supply, in form of personnel from one project to another or if additional personal needs to be hired.

(4) Everything is done in excel. IFS give an overview of resource capacity, showed earlier in Figure 32. It is not used because the information in IFS never gets updated with the new data and information and no scenario simulations are performed because there is not enough time or resources to do it.

(5) The effectiveness of their S&OP process, also called IBP, is not measured. What is measured is planned cost of projects vs actual costs. The time is takes to execute an order is logged in IFS and delivery precision of projects are measured.

(6) There is no response to disruptions of the demand forecast.

(7) There is a process in place of how to respond to disruptions of operations and it is called lesson learned, to avoid requiring errors. It is not widely used in the organization and the production department does not even know it exists.

(8) When disruptions are encountered it is handled by unofficial meetings to solve the problem here and now.

(9) The meetings are physical presences.

(10) There is no S&OP coordinator. The top management and functional managers for the departments are responsible for the IBP process.
5 Sales and Operations Planning Framework

This chapter is presenting a framework developed based on theories, the collected data and with focus on organizations in the A&D industry.

5.1 Organizational Structure

To work with S&OP, the organization needs to be cross-functional managed (Palmatier, 2002). A matrix organizational structure gives the organization the right pre-conditions to work with S&OP and to be cross-functional. A matrix organization has its advantages and disadvantages. The dual-hierarchy could lead to confusion and conflicts over responsibility and decision making. To help support a matrix organization there needs to be vertical and horizontal linkages, to help information sharing and communication between employees and departments. The vertical linkages define the reporting relationships in the hierarchy and the horizontal linkages define the relationship across departments.

**Vertical Linkages**
- When employees encounter a problem they cannot solve, it is transferred to the next level in the hierarchy, and then back when solved.
- With the use of repeating tasks and standard procedures employees can act without approval or direct communication with managers.
- Plans help to provide guidance to employees e.g. budgets and annual objectives.
- Information is communicated vertically with process reports, written and online communication to managers. (Daft et al., 2014)

**Horizontal Linkages**
- Information is shared across department with progress, encountered problems, activities, risks and opportunities.
- Having a person working with direct communication between two departments.
- Temporary committee of representative from each department working together.
- A full-time integrator delegating and coordinating across the different departments.
- Project teams that are permanent task forces. (Daft et al., 2014)

5.2 Sales and Operations Planning Process

The aim of S&OP planning is to find a balance between supply and demand and develop a plan for the coming future. The general guideline is that the plan should cover a 18-24-month period but for the A&D industry, the plan needs to be longer and this framework is presenting a five-year plan. To reach a high level of S&OP maturity and work proactive, the organization needs to fulfil the requirements shown in Table 6.
Table 6 - Proactive S&OP (Grimson & Pyke, 2007, p. 330)

<table>
<thead>
<tr>
<th>Meetings &amp; Collaboration</th>
<th>Organization</th>
<th>Measurements</th>
<th>Information Technology</th>
<th>S&amp;OP Plan Integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Event driven meetings supersede scheduled meetings</td>
<td>• Throughout the organization, S&amp;OP is understood as a tool for optimizing company profit.</td>
<td>• Measure how well operations meet the sales plan</td>
<td>• Integrated S&amp;OP optimization software</td>
<td>• Seamless integration of plans</td>
</tr>
<tr>
<td>• Real-time access to external data</td>
<td>• Sales measured on forecast accuracy</td>
<td>• Sales measured on forecast accuracy</td>
<td>• Full interface with ERP, accounting, forecasting</td>
<td>• Process focuses on profit optimization for whole company</td>
</tr>
<tr>
<td></td>
<td>• New product introduction</td>
<td>• New product introduction</td>
<td>• Real-time solver</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• S&amp;OP effectiveness</td>
<td>• S&amp;OP effectiveness</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Company profitability</td>
<td>• Company profitability</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.2.1 Five Step Process

S&OP is a monthly process and the outcome is a plan to balance demand and supply for the coming five-years. This process is described in five steps, and all the steps are a sub-process and they are performed in order. All the sub-process needs a process owner and they need to be performed every month and the faster they are completed, the better. The shorter the S&OP cycle is, the more current information is used in each step. This five-step process is developed based on the monthly S&OP process cycle established by Palmatier (2002). All five sub-processes need to follow the basis practices showed in Figure 33.

- Review performance
- Discuss known changes
- Review the made assumptions
- Review resources utilization
- Determine any desired or recommended changes to action plans and resource changes
- Conduct both a qualitative and quantitative review and update of plan

Figure 33 - Basis practices applied for all five steps in the S&OP process (Palmatier, 2002, p. 126)

After each sub-process is completed and the meeting is finished, the minutes from the meeting needs to be circulated immediately, no longer than 48 hours afterwards. As a reminder to participants of what was agreed upon and who is involved in what activities and how they are involved with an RACI chart.

**Responsible** — The person who is assigned to do the work and contribute as much as possible  
**Accountable** — The person who is responsible and makes the final decision  
**Consulted** — The person who need to be consulted before a decision is made because they have expertise in the area, or they exercise some authority  
**Informed** — The person whom the decision will affect and who therefore need to be notified if a decision or action has been taken (Brune, 2006)

**Step 1 - Product Review**

_The purpose is to understand what products will be available to sell and when._

Files and systems need to be updated with last month’s data for actual sales, inventory and production. The different projects need to update their schedules and timetables for the remaining project-time or for the coming five-years if the project-time exceeds five-years. It needs to be done for all projects in the organization to be able to make decisions based on what is best for the organization as a whole and not
Sales and Operations Planning Framework

only specific projects and to make sure that the projects stay within time and budget. The output of this step is an update of the product development, launch plans and anticipated product end-of-life plans. It is done by agreeing on priorities for product developments.

Step 2 - Demand Review

The purpose is to develop an unconstrained and realistic plan of what the company is committed to selling over a five-year period including volume and value.

A company within the A&D industry could be under restrictions from the government and would not be able sell their products to customers of their choice. The government wants to make sure the organizations products are not sold to the wrong customers and could be used against their own country. It is important to get multiple views when developing a demand plan because it gives a more accurate forecast. The demand review needs to get different views and inputs from the sales and marketing department and employees that have inputs from customers and suppliers.

Reliable data is available and retrieved from the update that is done in the product review. MRO is a big part of the A&D industry’s orders and with historical data, forecasts can be made of parts that need replacement during maintenance and parts that fail randomly during usage. The more accurate the historical data is the higher quality the statistical demand forecast is for MRO. It is also critical to do long-range forecasts before making R&D investments for NPD. It can only be done when knowing the size of the market, market shares and drivers of demand. Scenario planning needs to be used to predict multiple possible futures instead of just one. With scenario planning the organization can be prepared for different outcomes and have action plans ready if they do occur and handle the effects it has on the demand.

The organization needs to build strong relations with customers to communicate forecasts, firm commitments and lead-times and not only have contact with customers when there are problems or when the customer wants to place an order. With customer-linking the organization would know the demand and coming orders before the order is placed and could start planning for the coming demand. With collaboration with suppliers and customers, they can together develop a product forecast and plan for the demand.

The demand plan needs to be measured by looking at the demand plan from the three previous months. Measuring the accuracy of the demand planning and if what was planned for was the actual outcome. This is done to find errors and to be able to find root-causes of misleading and wrong demand planning and to prevent it from happening again. The only way to see if something is improving is to measure it.

Step 3 - Supply Review

The purpose is to develop a plan to meet the demand plan for a five-year period.

The supply planning is done on an aggregated level for the key work centres and critical resources required to meet the demand. The supply review needs to make sure that the customer demands, timeframe and inventory targets are met. By reviewing past performance from the three previous months compared to what was planned for and to take learnings from and to identify root causes of performance variance in order to prevent it from occurring again. Figure 34 is an example of supply performance measurements and by symbolising the performance with green, yellow and red colours, give employees a clear and visual image of the performance instead of just looking at numbers.
After reviewing the performance, the supply review needs to look at the new demand plan developed in the demand review and determine if the plan can be met with the resources available and within the projected cost. The objective is to review the demand plan, compare it to the demonstrated capacity, make a rough-cut capacity analysis and use the three-knob principle (work, time, resources) to adjust the resources according to the demand plan.

Scenario planning is used to predict multiple possible futures instead of just one for the supply. With scenario planning the organization can be prepared for different outcomes and have action plans ready if they do occur and the effects it has on the supply.

**Step 4 - Financial Review**

*The purpose is to develop projected pro-forma financials for a five-year planning horizon.*

The financial review process needs a coordinator who participates during both the demand and supply review meetings to make sure that the projected pricing is discussed and agreed upon. In the supply review the coordinator needs to make sure that projected cost issues are discussed and agreed upon. The coordinator does not have the authority to make decisions during these meeting, only to question and challenge issues that may arise concerning finance and costs. The coordinator keeps the process owner for the financial review informed of upcoming issues and major changes based on the decisions made at the review meetings. Based on the quantitative data from the demand and supply review the coordinator develops a pro-forma income statement, balance sheet and cash flow analysis for the coming five-years. The financial review process also includes the development of a month-by-month financial projection to demonstrate any changes to the plan. The financial review does not necessarily need a meeting, but the information and result needs to be communicated to the top management.

**Step 5 - S&OP Meeting**

*The purpose is to review the recommendations and finalize an S&OP plan with balanced supply and demand for a five-year period.*

This is not a meeting for discussions, it is a meeting where recommendations are reviewed, and decisions are made. When the process reaches step number 5, the S&OP plan has already been established and is finalized in step number 4. It is important that the top management participates in these meetings. Together, the management must review the plan and make adjustments, if necessary. Decisions are made based on what is best for the organization as a whole. The meeting agenda is showed in Figure 35.
• What have changed since last month?
• Are we on plan financially?
• How are we performing to our company goals and key performance indicators?
• What new or different risks do we need to understand or consider?
• What decisions need to be made or approved in this S&OP cycle?
• What decisions will we be compelled to make within the next few months?
• How are the individual product families or product groupings performing?
• Are we on schedule, on cost, on scope with our product development efforts?
• How are we performing to the company initiatives? Are we on scope, on schedule, on cost?
• Do we have any resource constraints, and how well are we utilizing our key resources?
• Are we comfortable with the plan across the entire planning horizon?
• Is there any reason to revisit our strategic plans or company goals?
• What did we do well in this cycle of S&OP? What might we improve?

Figure 35 - S&OP meeting agenda (Palmatier, 2002, p. 151)
6 Analysis

This chapter is presenting an analysis of the company, the differences between the developed sales and operations planning framework and their current state and how sales and operations planning should be implemented.

6.1 GAP Analysis

The company has an S&OP process, called IBP and it is a yearly process and is supposed to be a further development of S&OP and more advanced. The problem is that the data and information used to develop the strategies keeps changing during the year. When the plan is finalized a year later, the plan is already old and outdated. New information and data are available, and the conditions have changed since the start of the IBP process. Table 7 is showing the GAP between current state at the company and the developed S&OP framework presented in Chapter 5.

Table 7 - GAP analysis of the current state at the company and the developed framework

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current State</strong></td>
<td>The FABO-list and projects are updated once a month for the coming financial year and four times a year the whole IBP process. There are processes in place of how to update systems, but it is not done.</td>
<td>The demand is the follow-on and actual orders in the FABO-list. There is no response to the disruptions of the demand forecasts.</td>
<td>Supply planning is done four times a year based on the follow-on and actual orders from the FABO-list but for projects, the supply planning is done on a monthly basis.</td>
<td>There are no official S&amp;OP meetings. Only the IBP process that is done one a yearly basis and handled by the top management.</td>
</tr>
<tr>
<td><strong>Framework</strong></td>
<td>Monthly update systems with the most current information and understand what products will be available to sell and when.</td>
<td>Monthly develop an unconstrained and realistic demand plan of what the company is committed to selling over a five-year period including volume and value.</td>
<td>Monthly develop a supply plan to meet the demand plan for a five-year period.</td>
<td>Monthly review the recommendations and finalize an S&amp;OP plan with balanced supply and demand for the coming five-years.</td>
</tr>
<tr>
<td><strong>GAP</strong></td>
<td>There is no full integration between projects on a monthly basis and systems are not updated according to their processes, there is not</td>
<td>The demand planning is done monthly but it is not a process. The information from the FABO-list is the input for demand and what is used. There is no</td>
<td>The supply planning is only done four times a year, not on a monthly basis for the whole IBP process only for the projects separately.</td>
<td>There is no projected pro-forma, only measuring actual costs versus spendings and value of orders received versus the outcome.</td>
</tr>
</tbody>
</table>
6.2 Integration and Implementation

The main focus of S&OP is on the mind-set of people (Palmatier, 2002). S&OP should not be seen as extra work, it should be a part of day-to-day routine and something that helps and support them and not extra work load.

6.2.1 Implementing Process

The company has had numerous of improvement project and new processes have been implemented but the result has not been as good as they hoped for. The reason is that the mind-set of the people has not been there and that is why education is critical for the implementation process of S&OP because without education it is just seen as another improvement project that leads nowhere and no one is committed to actually succeed. Everyone needs to be involved and understand what they are doing and why they are doing it, to be committed. The company does have a lot of processes and routines today, but they are not followed because a process is not the answer, it is only as good as how people use it to make decisions. The real result of S&OP comes from developing a strong understanding. A long implementation is expensive and the longer it takes the more benefits will be lost and management will lose interest if it does not show result fast enough (Palmatier, 2002) and that is why the implementation is critical and needs to be done as fast as possible. When the first monthly cycle is up and running of the S&OP process, only a few of the company’s projects and products should be included. The first monthly cycle is a part of the education with learning by doing for the employees. The rest of the company’s projects and products will be added on in future months when the process is stable and standardized. The company needs to follow the four steps of implementation developed by Palmatier (2002):

1. Education
2. Process design
3. Getting started
4. Learn by doing

6.2.2 Culture Change

The ability of an organization to adapt to changes and work with continual improvements is determined by the organizational culture (Franchetti, 2009). The company needs to have an effective culture of quality to reach performance excellence and to successfully implement and work with S&OP. A culture where all the departments and functions actively participate in the S&OP process. The culture today at the company is different for different departments. The whole organization does not have shared values and believes, it is department depended. With the help of the Juran Transformation Model consisting of five organizational breakthroughs the company will be able to change the culture to have shared values and believes throughout the organization and sustain the transformation. The five organizational breakthroughs are:

1. Leadership and management
2. Organization and structure
3. Current performance
4. Culture
5. Adaptability
Leadership and management
Each year the management sets several strategies based on their vision. The strategies are long term goals that they want to achieve on a high level, referring to the whole organization and specific strategies for different products. It is the department’s responsibility to individually develop their own strategies and goals based on the overall strategies, but this is only done for some of the organization’s departments today. Employees are missing guidance and they do not have their own specific goals and they do not know how they can affect the result and the overall success for the company and what is expected of them.

The management needs to set performance goals to give guidance to individual employees. The goals need to be clearly communicated and employees need to be motivated and it is important that everyone understands the goals and agrees. Commitment without understanding is a liability. With the help of performance reviews which are done on a regular basis, employees would get feedback about what they are doing right and what needs to be improved. It is an opportunity for the management to help the employees learn from the past and set new goals (Poole, 2013). If counterproductive behaviour or conflicts arise there need to be guidelines of how to make decisions based on the situation to solve the problem as quick and smooth as possible (DeFeo & Juran, 2014). Everyone works in projects and it is important that during the performance reviews, the management gets inputs for the project manager of the employee’s performance.

Organization and structure
Today the company have a functional organizational structure and the formal reporting relationships and the levels of the hierarchy are confusing. Employees report to two people, the project manager and the functional manager. Both the overall structure and the projects have a functional structure and there is no organizational chart showing the correlation between functional departments and projects. For S&OP to be successful, a matrix organizational structure would be the most effective and efficient way the organization needs to be designed in order to work towards their goals. A matrix organizational structure would give the company the right pre-conditions to work with S&OP and to be cross-functional with defined vertical and horizontal linkages. Figure 36 is an illustration of the company structure as a matrix structure and how the organization should be structured for the S&OP work to be efficient and successful.

![Matrix organizational structure for the company](image)
Current performance
At the company today, there is not enough time and resources to find the root cause of problems and eliminate them. The company has a process today called lesson learned, it is supposed to be a routine of how to handle things that are wrong with products, services or processes, and the associated customer dissatisfaction and high costs. The lesson learned process is rarely used and most employees do not know it exists, only the management. For the culture to change, the lesson learned process needs to be integrated and used throughout the organization and the focus should be on the people. The process is implemented but the people are not aware, and education is critical for the lesson learned to show a good result. According to the company, there are not enough resources to work with lessons learned on a daily basis, but this is critical, and it needs to be done to improve.

Culture
The management needs to review the vision, mission and values and make sure that all employees are engaged and involved. The company does yearly present the company’s new vision, mission and values for all employees in the whole company. The problem is that they are abstract, and employees do not know how they can contribute to achieving the vision. For the culture to change, the issues defined by DeFeo and Juran (2014) must be addressed before the culture change is sustainable:

- Orientation of new employees and training practices
- Reward and recognition of policies and practices
- Human resource policies and administration
- Quality and customer satisfaction policies
- Fanatic commitment to customers and their satisfaction
- Commitment to continuous improvement
- Standards and conduct codes, including ethics
- No “sacred cows” regarding people, practices, and core business content

Adaptability
The environmental conditions are changing, and so needs the organization and adapt to the new conditions. This is critical for the survival of the company. It is important to always give feedback, and lesson learned after decisions have been made to learn from the experience.

6.2.3 Master Schedule
The first step in S&OP is to balance supply and demand, but it is a master schedule that keeps the two together and supports the S&OP, see Figure 37. The company does not have a master schedule today, only schedules for the individual projects. The company is in the process of implementing new business-management software, but S&OP requires that processes, people and tools all work together and overlap. People needs to have the right knowledge, be trained, understand what is expected of them and work according to principles, policies and procedures. The process is a defined way of operating and working with process steps, inputs, outputs, measurements and defined roles and responsibilities within the organization. The tools, also referred to as technology is the tools that people need, to be able to work according to the process e.g. software and manuals. For the company the new business-management software would be included in the category tools. During interviews the interviewees have expressed concern about issues and problems they are experiencing in the company today but that it will all be fixed with the new business-management software. That is not the case, processes, people and tools all work together. The company needs to make sure that all three, processes, people and tools are all work together and not rely on the new business-management software to solve their problems, because tools does not give an integrated management process.
6.2.4 Measure Improvements

In order to know if something is improving, it needs to be measured (Danese, Molinaro, & Romano, 2017; Boutros & Purdie, 2014; Palmatier, 2002) and the company needs to do it for both individual employees and for the effectiveness of their S&OP process. Employees need to know what they are meant to do, how they can affect the result of their work and they also need to know the result of their work. Today employees have no way of measuring their individual work, see their result and how they are contributing to the overall success for the company and the vision.

What the company is measuring need to be clear. By using the structure of measuring and developing goals defined by Higgins et al., (2008) the company would have the right pre-conditions to work with the right type of goals and measure their success.

**Title.** Explaining what is measured and why.

**Purpose.** Specifying the underlying logical basis of the measure.

**Relates to.** What business objective it related to.

**Target.** Targets of the KPI to evaluate the level of performance.

**Formula.** Measure the performance in the right way because it affects how people behave.
Analysis

**Frequency of measurement.** When it is measured, based on the volume of data available.

**Frequency of review.** How often it is reviewed.

**Who measures.** One person is responsible for the collection and reporting of the data.

**Source of data.** Consistent source of data is critical.

**Who owns the measure.** Each KPI needs to have an owner.

**Balanced scorecards**

Balanced scorecards (BSC) is a strategic performance management tool (Geng, 2004) that would help the company to consider multiple stakeholders and give the management a balanced look of key results. With the help of looking at the organization from four different perspectives:

1. **Financial**—How should we appear to our shareholders to succeed financially?
2. **Customer**—How should we appear to our customers to achieve our vision?
3. **Internal business processes**—What business process must we excel and what could we be best at to satisfy our stakeholders?
4. **Learning and growth**—How can we sustain and improve our ability to change with the help people, skills, training, knowledge and leadership to achieve our vision?

Table 8 is presenting a starting point for the company and could be configured for the own organization once the S&OP process is up and running and when the company has learned by doing.
Table 8 - Balanced scorecard for S&OP (Palmatier, 2002, p. 98)

<table>
<thead>
<tr>
<th>Sales and Operations Planning</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was everyone prepared?</td>
<td>Red</td>
<td>Yellow</td>
<td>Green</td>
</tr>
<tr>
<td>Were the right people present?</td>
<td>Red</td>
<td>Red</td>
<td>Yellow</td>
</tr>
<tr>
<td>Was the information at the right level of detail?</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Green</td>
</tr>
<tr>
<td>Were the needed decisions made?</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Green</td>
</tr>
<tr>
<td>Did we make efficient use of our time?</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Green</td>
</tr>
<tr>
<td>Can we improve the S&amp;OP process?</td>
<td>Red</td>
<td>Red</td>
<td>Yellow</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Financials</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT ($)</td>
<td>Red</td>
<td>Yellow</td>
<td>Green</td>
</tr>
<tr>
<td>Sales revenue to plan ($)</td>
<td>Green</td>
<td>Green</td>
<td>Yellow</td>
</tr>
<tr>
<td>Margin % to plan</td>
<td>Green</td>
<td>Green</td>
<td>Yellow</td>
</tr>
<tr>
<td>Operating expenses to budget ($)</td>
<td>Green</td>
<td>Green</td>
<td>Yellow</td>
</tr>
<tr>
<td>Cost drivers</td>
<td>Green</td>
<td>Yellow</td>
<td>Red</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supply</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing revenue to plan</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
<tr>
<td>Inventory value ($) and turns</td>
<td>Green</td>
<td>Green</td>
<td>Yellow</td>
</tr>
<tr>
<td>Supplier quality performance</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
<tr>
<td>Initial test yields ($)</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
<tr>
<td>Cycle times (days)</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
<tr>
<td>Inventory record accuracy (%)</td>
<td>Green</td>
<td>Yellow</td>
<td>Yellow</td>
</tr>
<tr>
<td>Production plan vs. actual (%)</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td>Master schedule performance (%)</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td>Master schedule stability (weekly)</td>
<td>Green</td>
<td>Yellow</td>
<td>Red</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Products</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>New product introduction on-time performance (%)</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td>Cycle time to first customer prototype</td>
<td>Green</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Cycle time to safety approval</td>
<td>Yellow</td>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td>Average cycle time</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td>Project development costs</td>
<td>Green</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Development resource load to capacity ratio</td>
<td>Yellow</td>
<td>Red</td>
<td>Red</td>
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</table>

<table>
<thead>
<tr>
<th>Demand</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forecast vs. actual by subfamily (units and %)</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Yellow</td>
</tr>
<tr>
<td>Forecast vs. actual by top 30 sku mix</td>
<td>Green</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Inventory performance by customer group</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
<tr>
<td>On-time customer service performance (%)</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
<tr>
<td>Bookings activity</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
<tr>
<td>Past due customer orders</td>
<td>Green</td>
<td>Yellow</td>
<td>Yellow</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Markets</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total market forecast accuracy</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
<tr>
<td>Market #1 market share</td>
<td>Green</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Market #2 market share</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
<tr>
<td>Competitive portfolio positioning</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Red</td>
</tr>
</tbody>
</table>
7 Discussion

This chapter is presenting analysis and comments about the results and methods used.

7.1 Result Discussion

The result of this thesis project is an S&OP framework suitable for the case company based on already established theories and models represented in Chapter 3 Literature Review. The result is only recommendations of how the S&OP process should look like and how it should be implemented based on their current situation. An implementation and use of the framework will not be possible without the top management’s commitment because without their commitment it is just another improvement project resulting in little or no result (Palmatier, 2002). The process design also takes shape during the implementation phase and by learning by doing in order to be able to develop the best suitable S&OP process. (Palmatier, 2002). Education is critical for the implementation process because without education it is just seen as another improvement project that leads nowhere and no one is committed to actually succeeding (Palmatier, 2002). The focus of S&OP is on people, people need to understand, be educated and committed. The developed framework is only the starting point and it gets modified during the implementation phase to what is best suited for the organization and employees with the help of their understanding of what S&OP actually is.

The company’s current S&OP process called IBP is a yearly process meaning that the data and information used at the beginning of the process are old when the plan is finalized meaning that the plan is outdated as soon as it is finished. Oliver Wight (2018), have described IBP as a further development and evaluation of S&OP and is described as an advance S&OP process. IBP is an advanced S&OP but despite that, the company’s S&OP maturity level is reactive, and the goal is to be proactive, which is the highest level of maturity an S&OP can have (Grimson & Pyke, 2007).

An organization is a society which consists of habits and believes and is held together by shared values (DeFeo & Juran, 2014; Daft, 2009). One big challenge the company is facing is the culture difference for the different departments, they do not have shared values and believes. The organizational culture is department depended. The organizational culture is hard to change and even harder to sustain (Miller, Villafuerte, & Wroblewski, 2014). The ability of an organization to adapt to changes and work with continual improvements is determined by the organizational culture (Franchetti, 2009). To successfully implement and work with S&OP, the company needs an effective organizational culture and the organizational culture of today needs to change.

The company’s organizational structure is not representing the way they work. There is no correlation between the overall organizational structure and its projects. There is also a lack of integration and interaction between; people, processes and tools. Today the company have a lot of processes, but it is not integrated with people and tools. What stands out from the analysis of the current state at the company are the goals and strategies. Employees are missing guidance because the developed goals are only on a high strategical level and it is too hard to grasp. To give employees the right pre-conditions to do a good job they need to know what he or she is meant to do, how they can affect the result and they also need to know the result of their work to get motivated and to be encouraged to work harder (Sandholm, 1999).

7.2 Method Discussion

The method used for this project was a case study. A case study is a study where the researches aim is to beyond data and statistical results to get an in-depth understand (Tellis, 1997). The method helped the author to get an in-depth understanding of the case company. The author used interviews, internal company restricted documents, surveys and observations to collect data and information. The interviews were a compliment to the internal company restricted documents. The internal company restricted documents included process maps describing their processes, but they are complicated to understand for
Discussion

someone who is new. The interviews also showed that the processes maps are not fully followed, and a lot of work is done based on experience or by the employees own developed best practice. It gave the author two different views of how the work is actually performed, one from the process map describing how the work should be performed and from the interviews, how they performed the work. This also means that the author got different explanations from different people, depending on who she talked to because they described their way of working and this influences the reliability. Reliability is to prove that if the research would be repeated, the outcome would be the same (Yin, 1994). Chapter 2 Methodology describes how the work was carried out, who was interviewed and the purpose of the interview. If this research would be repeated, the result would be the same if the same people would be interviewed but if a different person would be interviewed to fulfil the same aim, the results could vary.

The observations were only observations of the daily work that gave the author a view of the organizational culture. The author spent her time at different departments meaning that she got an overview of the culture for the whole organization and not just one specific department.

The author handed out the survey in paper form to employees about the organizational culture. A survey is a questionnaire with structured questions and short-answers (Haeffele, Gardner, & Vogt, 2012). The surveys had short answers but the feedback she got afterwards was that the questions where hard and there was too much text. The result was that only half of the handed-out surveys where received back. This could have been avoided by having easier questions. The author would then have gotten a broader view of the culture with more response.

The author has justified the research validity by using multiple sources of information and references proving the same thing, but there is a limited number of frameworks and models available (Ptak & Smith, 2011). The author has had most use of the following source:


It is a book describing a company going from chaos to organised common sense with the help of S&OP. The book has been used extensively throughout the project and helped the author to understand in practice, what S&OP is, how it is implemented and why it is so important.
8 Conclusion and Recommendations

This chapter is presenting to what extent the aim has been achieved. It contains a summary of the findings and answers the research questions in detail. It also includes recommendations for the company and ideas for future and continued work.

8.1 Main Findings

The following section presents the conclusions of the thesis project linked to the research questions.

1. How does the company work with sales and operations planning today?

The company works according to a process called integrated business planning (IBP). Oliver Wight (2018), have described IBP as a further development and evaluation of S&OP and is described as an advance S&OP process. The focus of IBP is on growing the business in ways that benefit all stakeholders in the supply chain (Oliver Wight, 2018). The company’s IBP is a central part of their operational framework and strategy management. The IBP comprises a strategic plan and a financial forecast for the current financial year and financial projections for the next five-years. The IBP process is divided into two phases, IBP1 and IBP2.

![Figure 38 - Integrated business process at the company (Company Intranet, 2018)](image)

IBP1 is the strategic phases were the integrated business plan is developed. It is a broad assessment of the organizations current strategic and financial position in the marketplace. The IBP1 process starts at the end of each year and it includes developments of strategies and plans based on past results, demand and the visions and strategies set by the top management. The IBP2 process starts when phase one is complete, which is halfway through the year and continues until the end of the year and all the company’s departments are a part of this phase. IBP2 is an evaluation of the options or actions identified in phase one. In phase two, a detailed strategic and financial five-year plan is set, reviewed and approved. It includes key assumptions that have been made and identified major business milestones. The targets and goals are modified into actual numbers that can be measured and analysed. A detailed IBP sets the basis and foundation for the coming financial year. The company’s work with IBP is a yearly cycle and once phase two is done, the work of developing phase one starts again.

2. What is the ideal framework for sales and operations planning for the company from a theoretical perspective?

The developed S&OP framework is based on the five-step process developed by Palmatier (2002) and it is a monthly process.
Conclusion and Recommendations

Step 1 - Product Review
The purpose is to understand what products will be available to sell and when.

Files and systems need to be updated with last month’s data for actual sales, inventory and production. The different projects need to update their schedules and timetables for the remaining project-time or for the coming five years if the project-time exceeds five years. It needs to be done for all projects in the organization to be able to make decisions based on what is best for the organization as a whole and not specific project and to make sure that the projects stay within time and budget. The output of this step is an update of product development, launch plans and anticipated product end-of-life plans. It is done by agreeing on priorities for product developments.

Step 2 - Demand Review
The purpose is to develop an unconstrained and realistic plan of what the company is committed to selling over a five-year period including volume and value.

A company in the A&D industry is to some extent controlled by the government and cannot sell their products to customers of their choice. The government wants to make sure the company’s products are not sold to the wrong customers and could be used against their own country. It is important to get multiple views when developing a demand plan because it gives a more accurate forecast. The demand review needs to get different views and inputs from the sales and marketing department and employees that have inputs from customers and suppliers.

Reliable data is available and retrieved from the update that is done in the product review. MRO is a big part of the A&D industry’s orders and with historical data, forecasts can be made of parts that need replacement during maintenance and parts that fail randomly during usage. The more accurate the historical data is the higher quality the statistical demand forecast is for MRO. It is also critical to do long-range forecasts before making R&D investments for NPD. It can only be done when knowing the size of the market, market shares and drivers of demand. Scenario planning needs to be used to predict multiple possible futures instead of just one. With scenario planning the company can be prepared for different outcomes and have action plans ready if they do occur and handle the effects it has on the demand.

Build stronger relations with their customers to communicate forecasts, firm commitments and lead-times. Not only having contact with the customers when there are problems or when the customer wants to place an order. With customer-linking the company would know the demand and coming orders before the order is placed and could start planning for the coming demand. With collaboration with suppliers and customers, they can together develop a product forecast and plan for the demand.

The demand plan needs to be measured by looking at the demand plan from the three previous months. Measuring the accuracy of the demand planning and if what was planned for was the actual outcome. This is done to find errors and to be able to find root-causes of misleading and wrong demand planning and to prevent it from happening again. The only way to see if something is improving is to measure it.

Step 3 - Supply Review
The purpose is to develop a plan to meet the demand plan for a five-year period.

The supply planning is done on an aggregated level for the key work centers and critical resources required to meet the demand. The supply review needs to make sure that the customer demands, timeframe and inventory targets are met. By review past performance from the three previous months compared to what was planned for and to take learnings from and to identify root causes of performance variance in order to prevent it from occurring again. Figure 39 is an example of supply performance measurements.
After reviewing the performance, the supply review needs to look at the new demand plan developed in the demand review and determine if the plan can be met with the resources available and within the projected cost. The objective is to review the demand plan, compare it to the demonstrated capacity, make a rough-cut capacity analysis and use the three-knob principle (work, time, resources) to adjust the resources according to the demand plan.

Scenario planning is used to predict multiple possible futures instead of just one for the supply. With scenario planning the company can be prepared for different outcomes and have action plans ready if they do occur and the effects it has on the supply.

**Step 4 - Financial Review**
*The purpose is to develop projected pro-forma financials for a five-year planning horizon.*

The financial review process needs a coordinator who participates during both the demand and supply review meetings to make sure that the projected pricing is discussed and agreed upon. In the supply review the coordinator needs to make sure that projected cost issues are discussed and agreed upon. The coordinator does not have to authority to make decisions during these meeting, only to question and challenge issues that may arise concerning finance and costs. The coordinator keeps the process owner for the financial review informed of upcoming issues and major changes based on the decisions made at the review meetings. Based on the quantitative data from the demand and supply review the coordinator develops a pro-forma income statement, balance sheet and cash flow analysis for the coming five-years. The financial review process also includes the development of a month-by-month financial projection to demonstrate any changes to the plan. The financial review does not necessarily need a meeting, but the information and result need to be communicated to the top management.

**Step 5 - S&OP Meeting**
*The purpose is to review the recommendations and finalize an S&OP plan with balanced supply and demand for a five-year period.*

This is not a meeting for discussions, it is a meeting where recommendations are reviewed, and decisions are made. When the process reaches step number 5, the S&OP plan has already been established and is finalized in step number 4. It is important that the top management participates in these meetings. Together, the management must review the plan and make adjustments, if necessary. Decisions are made based on what is best for the organization as a whole. The meeting agenda is showed in Figure 35.
3. How does the current state at the company differ from the ideal framework?

The difference between the current state at the company and the ideal framework was done with a GAP analysis and is presented below in Table 9.

Figure 40 - S&OP meeting agenda (Palmatier, 2002, p. 151)
Table 9 - GAP analysis of the current state at the company and the developed framework

<table>
<thead>
<tr>
<th>Current State</th>
<th>Framework</th>
<th>GAP</th>
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<tbody>
<tr>
<td><strong>Product Review</strong></td>
<td>Monthly update systems with the most current information and understand what products will be available to sell and when.</td>
<td>There is no full integration between projects on a monthly basis and systems are not updated according to their processes, there is not enough time and resources.</td>
</tr>
<tr>
<td><strong>Demand Review</strong></td>
<td>The demand is the follow-on and actual orders in the FABO-list. There is no response to the disruptions of the demand forecasts.</td>
<td>The demand planning is done monthly but it is not a process. The information from the FABO-list is the input for demand and what is used. There is no response to disruptions.</td>
</tr>
<tr>
<td><strong>Supply Review</strong></td>
<td>Supply planning is done four times a year based on the follow-on and actual orders from the FABO-list but for projects, the supply planning is done on a monthly basis.</td>
<td>The supply planning is only done four times a year, not on a monthly basis for the whole IBP process only for the projects separately.</td>
</tr>
<tr>
<td><strong>Financial Review</strong></td>
<td>The projects measure their spending’s compared to the budget monthly. Every month the value of order received, and sales are measured against what was planned and the actual outcome.</td>
<td>There is no projected pro-forma, only measuring actual costs versus spendings and value of orders received versus the outcome.</td>
</tr>
<tr>
<td><strong>S&amp;OP Meeting</strong></td>
<td>There are no official S&amp;OP meetings. Only the IBP process that is done one a yearly basis and handled by the top management.</td>
<td>Monthly S&amp;OP meetings are missing.</td>
</tr>
</tbody>
</table>

4. **What actions need to be taken from the company to improve their sales and operations planning based on the findings and result from research question three?**

Today the company’s S&OP process is on a reactive level of maturity. The actions that need to be taken from the company to improve and to be proactive in their sales and operations planning based on what was identified in the GAP analysis, shown in Table 9. The first step is to go from a yearly S&OP process to a monthly cycle and the top management needs to be committed and engaged. To make sure it is not another improvement project that shows no returns. The five actions for the five different steps of the S&OP are:
Conclusion and Recommendations

Product Review: There needs to be an integration between projects on a monthly basis and systems needs to be updated according to their processes. This needs to be a part of the job and not seen as extra work.

Demand Review: The demand planning needs to be a process and not just transferring of information. The process needs to include responses to disruptions.

Supply Review: The supply planning needs to be done on a monthly basis for all projects.

Financial Review: The company needs to develop projected pro-forma on a monthly basis.

S&OP Meeting: There needs to be S&OP meeting at the end of each S&OP cycle.

The company needs to make sure employees have goals to work towards and not only goals on a strategical level, but employees also need to have guidance and improvements needs to be measured. Everyone in the company needs to have shared values and believes and not as today situation where the organizational culture is department depended. The organizational structure needs to reflect the way the work is carried out between the overall organizational structure and project with a matrix organizational structure. The company also needs to make sure that processes are followed. Today there are processes in place, but employees choose to do the work according to their own best practice. Addition to this, the company has a business-management tool in use, but it is not integrated with people and processes and it needs to be.

8.2 Recommendations

The recommendations are based on findings from Chapter 6 Analysis, where the developed S&OP framework was compared to the current state at the company.

- Goals and strategies need to be further broken down for employees, to give them guidance of how they are contributing the success for the company and the vision.
- The projects within the company need to be fully integrated on a monthly basis to make decisions on what is best for the company as a whole.
- The company needs to make sure that people, tools, and process are all integrated.
- Needs to be responses to disturbance to eliminate the root causes of problems and lessons learned need to be used throughout the company and employees needs to know that the process exists.
- Supply and demand planning need to be done on a monthly basis and should not be seen as extra work. It should be a part of the daily routine and something that helps and support them and not the extra workload.
- Implementation of S&OP and other processes needs to focus on the mindset of the people, and it needs the top management support and commitment to succeed.
- The company needs to build stronger relationships with their customers and suppliers. With the help of continuous communication, they can together develop a product forecast and plan for the demand.

8.3 Future Research

This thesis project has developed a framework of how S&OP should be implemented and the monthly process of S&OP suitable for the case company based on their current position. The S&OP process and the monthly cycle best suitable for the organization will be further developed throughout the monthly processes and the implementation phase. During the implementation the S&OP process will get further modifications and employees together develop the process that is best suited for them. The suggested future research is to implement the framework the author has presented in this thesis and develop a framework of how to handle issues that may arise to the surface during the implementation, which the organization was unaware of.
9 References

This chapter is presenting the resources and sources used.


References


Personal Communication

Appendix 1 – S&OP questions to define the level of maturity

(1) Please describe your process to forecast demand:
   - Bottoms up/top down/mixture?
   - Who is involved? What organizational levels?
   - Time frame: 3/6/12/18 month/other?
   - How long does it take to generate a forecast?
   - How often are forecasts generated and updated?
   - What tools do you use – spreadsheets/more sophisticated software?
   - Do you involve your customers?

(2) Please describe your process for supply or operations planning:
   - Who is involved – organization?
   - Are any of your suppliers involved?
   - What inputs do you use from demand forecasts?
   - Who sees the operations plans when complete – sales/marketing?

(3) Please describe how you integrate the demand and supply plans:
   - Do you have meetings with both supply and demand side personnel?
   - If so, how often?
   - Is there pre-work for each meeting?
   - Is there a formal process? Please describe.
   - What time frame does S&OP focus on?
     - 0-3 months
     - 3-6 months
     - 6-18 months
     - Combination of the above?

(4) What IT structure is used for demand, supply, and S&OP planning?
   - Spreadsheets – is there a single one or several? How many?
   - Is there specific software suite that you use (e.g. Manugistics)?
   - Are the demand and supply side systems linked?
   - ERP system? – SAP, etc.
   - I-supply web site?
   - Scenario simulation and analysis?

(5) What measurements do you use to evaluate S&OP effectiveness?
   - Financial: cash flow, revenue, costs?
   - Managerial accounting: residual cash flow, IRR?
   - Operational: inventory turns, obsolescence, delivery performance, capacity utilization?
   - Marketing: accuracy of forecasts, variance to baseline?
   - New product introduction frequency & time to market?
   - How often are measurements taken?
(6) How do you respond to disruptions to your demand forecast?

(7) How do you respond to disruptions to operations?

(8) Do 6 & 7 lead to event driven S&OP or is it within the regular meetings?

(9) Meetings:

• Collaboration tools – video conference, physical presence, web tools?
• Customers? Suppliers?

(10) Organization:

• SOP coordinator? Full or part time? Who does he/she report to?
• SOP team – how many, full or part time, departments represented?
• Who from senior management is involved and how?
Appendix 2 – Culture survey

Assess each aspect by dividing 100 points among the four alternatives (a-d) for the current situation in your organization and for the preferred and desired situation according to you. Give a higher number of points to the alternative that is most similar to your organization and less or no points to the alternative that is least similar to your organization.

The department you work at: __________________________

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<tr>
<th>Question 1: Dominant Characteristics</th>
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<tbody>
<tr>
<td>a) The organization is a very personal place. It is like an extended family. People seem to share a lot of themselves.</td>
<td>a)</td>
<td>a)</td>
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<tr>
<td>b) The organization is a very dynamic entrepreneurial place. People are willing to stick out their necks and take risks</td>
<td>b)</td>
<td>b)</td>
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<tr>
<td>c) The organization is very results-oriented. A major concern is with getting the job done. People are very competitive and achievement-oriented</td>
<td>c)</td>
<td>c)</td>
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<tr>
<td>d) The organization is a very controlled and structured place. Formal procedures generally govern what people do.</td>
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<th>Question 2: Organizational Leadership</th>
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<tr>
<td>a) The leadership in the organization is generally considered to exemplify mentoring, facilitating, or nurturing.</td>
<td>a)</td>
<td>a)</td>
</tr>
<tr>
<td>b) The leadership in the organization is generally considered to exemplify entrepreneurship, innovation, or risk taking.</td>
<td>b)</td>
<td>b)</td>
</tr>
<tr>
<td>c) The leadership in the organization is generally considered to exemplify a no-nonsense, aggressive, results-oriented focus.</td>
<td>c)</td>
<td>c)</td>
</tr>
<tr>
<td>d) The leadership in the organization is generally considered to exemplify coordinating, organizing, or smooth-running efficiency.</td>
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<tr>
<th>Question 3: Management of Employees</th>
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<tr>
<td>a) The management style in the organization is characterized by teamwork, consensus, and participation.</td>
<td>a)</td>
<td>a)</td>
</tr>
<tr>
<td>b) The management style in the organization is characterized by individual risk taking, innovation, freedom, and uniqueness.</td>
<td>b)</td>
<td>b)</td>
</tr>
<tr>
<td>c) The management style in the organization is characterized by hard-driving competitiveness, high demands, and achievement.</td>
<td>c)</td>
<td>c)</td>
</tr>
<tr>
<td>d) The management style in the organization is characterized by security of employment, conformity, predictability, and stability in relationships.</td>
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Appendix

Question 4: Organization Glue

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- a) The glue that holds the organization together is loyalty and mutual trust. Commitment to this organization runs high.
- b) The glue that holds the organization together is commitment to innovation and development. There is an emphasis on being on the cutting edge.
- c) The glue that holds the organization together is an emphasis on achievement and goal accomplishment.
- d) The glue that holds the organization together is formal rules and policies. Maintaining a smooth-running organization is important.

Question 5: Strategic Emphases

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- a) The organization emphasizes human development. High trust, openness, and participation persist.
- b) The organization emphasizes acquiring new resources and creating new challenges. Trying new things and prospecting for opportunities are valued.
- c) The organization emphasizes competitive actions and achievement. Hitting stretch targets and winning in the marketplace are dominant.
- d) The organization emphasizes permanence and stability. Efficiency, control and smooth operations are important.

Question 6: Criteria of Success

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- a) The organization defines success on the basis of development of human resources, teamwork, employee commitment, and concern for people.
- b) The organization defines success on the basis of having the most unique or newest products. It is a product leader and innovator.
- c) The organization defines success on the basis of winning in the marketplace and outpacing the competition. Competitive market leadership is key.
- d) The organization defines success on the basis of efficiency. Dependable delivery, smooth scheduling and low-cost production are critical.
Appendix 3 – Result from surveys about the company culture

The blue colour represents the culture as they see it today and the green colour represents the desired and preferred organizational culture.

*Figure 1 – Production Department*  
*Figure 2 – Engineering and ILS Department*  
*Figure 3 – Quality and Environment Department*  
*Figure 4 – Program Department*
Figure 5 – Procurement Department

Figure 6 – Finance Department