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The Volvo Group logo, consisting of the word 'VOLVO' in a large, bold, white sans-serif font, with 'Volvo Group' in a smaller, white sans-serif font below it, all set against a dark teal background.

VOLVO
Volvo Group

Advanced Sales & Operations Planning **A Case Study at Volvo Group, Aftermarket**

*Master of Science Thesis
in the Supply Chain Management master's Programme*

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Advanced Sales & Operations Planning

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Abstract

S&OP and the balancing act of supply demand have recently been gaining a lot of attention. The advantages of being able to match supply with demand in the most efficient way is acknowledged as a way of reducing unnecessary cost and simultaneously achieving higher service levels, have already reached Volvo and Volvo Aftermarket. This thesis thus aims to provide with material allowing for further development of the S&OP process at Volvo Aftermarket.

With that stance four research questions were formulated to aid in substantiating and fulfilling the aim. *How can S&OP practice maturity be assessed?* - For which the result consists in a generic maturity model enabling assessment of companies. *How is Volvo's S&OP process designed?* - For which an answer consists in a thorough description of Volvo's current process design, or as-is analysis, and the affecting business environment. *What performance gaps in Volvo's processes can be identified using synthesised maturity framework?* - This RQ implies the comparison of the established maturity framework and the as-is analysis, whereas discrepancies in the process can be identified. *How can Volvo improve their current S&OP?* - For which the answer contributes with a shortlist of prioritised gaps that Volvo suggestively would benefit from filling.

The project was executed in accordance with abductive research methods. A constructed theoretical framework was compared with real-life observations in an iterative theory matching process. A theoretical suggestion and conclusion is made and finally an application of the theory become a solution.

As a result of the gap analysis and collaboration with participators of S&OP at Volvo a shortlist of cover-able gaps are summarised providing with Volvo more hands-on material for implementable improvements. These cover areas like measuring forecast quality coming from Volvo's sales department, informing policies for sales initiatives, forecast bias measuring, process compliance checklists, process templates standardisation and process name change. The complete list of recommendations is depicted in the recommendations chapter. The content aspires to provide with Volvo current industry practices and a theoretical framework indicating how to improve their S&OP internally, wherein part of this thesis' contribution lies. The created S&OP maturity framework is synthesised to enable mapping or benchmarking of S&OP not only for Volvo aftermarket but for any given company with a supply/demand balancing optimisation aspiration.

Keywords: Sales and Operations Planning, S&OP Maturity, Aftermarket, Supply Chain Management.

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Contents

List of Figures	xiii
List of Tables	xv
1 Introduction	1
1.1 Theoretical Background	1
1.2 Company Background - Volvo Group	2
1.3 Problem Identification	4
1.4 Aim	4
1.5 Research Questions	4
1.6 Delimitation	4
1.7 Overview: Model of Analysis	5
1.8 Disposition	5
2 Theoretical Framework	7
2.1 S&OP Context	7
2.2 S&OP Definition and Goals	7
2.3 S&OP Planning Parameters	9
2.3.1 Planning Horizon	9
2.3.2 Planning Frequency	9
2.3.3 Planning Objects	10
2.3.4 Units of Capacity	10
2.3.5 Time Fences for Changes in Plans	10
2.4 S&OP Process	10
2.4.1 Step 1: Product Management Review	11
2.4.2 Step 2: Demand Plan	12
2.4.3 Step 3: Supply Plan	13
2.4.4 Step 4: Rapprochement	13
2.4.5 Step 5: Measure and Communicate the Plan	14
2.5 S&OP Maturity	14
2.5.1 Meetings and Collaboration	15
2.5.2 Organisation	16
2.5.3 Measurements	18
2.5.4 Information Systems	20
2.5.5 S&OP Plan Integration	23
2.6 S&OP Performance Measurement	24

3	Methodology	27
3.1	Research Method	27
3.2	Data Collection	28
3.2.1	Primary Data	28
3.2.2	Secondary Data	31
3.3	Model of analysis	32
3.3.1	Research question 1	32
3.3.2	Research question 2	32
3.3.3	Research question 3	32
3.3.4	Research question 4	32
3.4	Reliability and Validity	33
4	Empirical Data	35
4.1	Volvo S&OP Context	35
4.1.1	Internal Context	37
4.1.1.1	Products and Differentiation	37
4.1.1.2	Organisation	37
4.1.1.3	Overall Strategy at Volvo Aftermarket	42
4.1.2	External Context	42
4.1.2.1	Upstream	43
4.1.2.2	Downstream	43
4.2	S&OP - Volvo Definition and Goals	44
4.3	Planning Parameters	44
4.3.1	Planning Horizon	44
4.3.2	Planning Frequency	44
4.3.3	Planning Objects	45
4.3.4	Units of Capacity	45
4.3.5	Time Fences for Changes in Plan	45
4.4	Volvo S&OP Process	46
4.4.1	Forecasting and the Supply Chain	46
4.4.2	S&OP Process Structure	46
4.4.2.1	1. Product Management Review	46
4.4.2.2	2. Demand Plan	46
4.4.2.3	3. Supply Plan	47
4.4.2.4	4. Rapprochement	47
4.4.2.5	5. Measure, Communicate and Implement the Plan	48
4.5	S&OP Dimensions at Volvo	48
4.5.1	Meetings and Collaboration	48
4.5.1.1	Dealer Facing Flow Planning Meetings	49
4.5.1.2	Parent Warehouse Flow Planning Meetings	49
4.5.1.3	Decision Meetings	50
4.5.2	Organisation	51
4.5.3	Measurements	52
4.5.4	ICT Structure	52
4.5.5	S&OP Plan Integration	53
5	Analysis	55

5.1	Planning Parameters	55
5.1.1	Planning Horizon	55
5.1.2	Planning Frequency	56
5.1.3	Planning Objects	56
5.1.4	Units of Capacity	56
5.1.5	Time Fences for Changes in Plans	57
5.2	S&OP Process	57
5.2.1	Product Management Review	57
5.2.2	Demand Plan	58
5.2.3	Supply Plan	59
5.2.4	Rapprochement	59
5.2.5	Measure, Communicate and Implement the Plan	60
5.3	Volvo S&OP Maturity Classification	60
5.3.1	Meetings and Collaboration	60
5.3.2	Organisation	62
5.3.3	Measurement	64
5.3.4	Information Systems	66
5.3.5	S&OP Plan Integration	68
5.4	Gap Summary	70
5.4.1	Gap Analysis	73
5.4.1.1	Internal Context	73
5.4.1.2	External Context	74
5.4.1.3	Gap classification	75
6	Recommendations	77
6.1	Implementation	77
6.2	Improvement areas	77
6.2.1	Low Hanging Fruit	78
6.2.2	Mid Term Opportunity	80
6.2.3	Long Term Development	81
6.2.4	Other improvement opportunities	82
6.3	Result of Suggested Implementations	83
7	Conclusion	85
7.1	Project Intention	85
7.2	Research Question Perspective	85
7.2.1	How can S&OP practice maturity be assessed?	85
7.2.2	How is Volvo's S&OP process designed?	85
7.2.3	What performance gaps in Volvo's processes can be identified using synthesised maturity framework?	86
7.2.4	How can Volvo improve their current S&OP?	86
7.3	Validity and Methods	87
7.4	Future Research	87
7.5	Generalisation	88
	Bibliography	91

A Appendix 1	I
A.1 Calculating maturity index for radar diagram in figure 5.6	I
A.2 Maturity Evaluation Dimensions	I
A.3 Questions from Interview Templates	VII

List of Figures

1.1	Volvo Group Brand Composition	2
1.2	Volvo Aftermarket Supply Chain	3
2.1	S&OP as a tactical process	8
2.2	S&OP process synthesis	11
2.3	New product review meeting, as adopted by Schorr (2007b)	12
2.4	Meetings and Collaboration Maturity Model	16
2.5	Organisation Maturity Model	18
2.6	Measurements Maturity Model	20
2.7	S&OP workbench, adopted from Lapide (2004)	21
2.8	Information Systems Maturity Model	23
2.9	S&OP Plan Integration Maturity Model	24
2.10	S&OP Goals, as adopted by Thomé et al. (2012)	26
3.1	Process Chart of Project	27
4.1	Volvo aftermarket supply chain	36
4.2	Global warehouse coverage, as adopted by Volvo Group (2015)	36
4.3	Organisational chart, Volvo Group	38
4.4	Organisational chart, Group Truck Operations and Logistic Services	39
4.5	Organisational chart, Material Management	40
4.6	Responsibility chart for the new to-be organisation at MM	40
4.7	Previous responsibility chart for the organisation at MM	41
4.8	S&OP meeting process	49
5.1	Meetings and Collaboration Maturity Evaluation	61
5.2	Organisation Maturity Evaluation	63
5.3	Measurement Maturity Evaluation	65
5.4	Information Systems Maturity Evaluation	67
5.5	Plan Integration Maturity Evaluation	69
5.6	Maturity Evaluation Radar Summary	71
6.1	Maturity evaluation radar summary after implementation of Low hanging fruit and Mid term opportunities	83
A.1	Meetings and Collaboration Maturity Evaluation	II
A.2	Meetings and Collaboration Maturity Evaluation - After implementation of improvement measures	II

List of Figures

A.3	Organisation Maturity Evaluation	III
A.4	Organisation Maturity Evaluation - After implementation of improvement measures	III
A.5	Measurement Maturity Evaluation	IV
A.6	Measurement Maturity Evaluation - After implementation of improvement measures	IV
A.7	Information Systems Maturity Evaluation	V
A.8	Information Systems Maturity Evaluation - After implementation of improvement measures	V
A.9	Plan Integration Maturity Evaluation	VI
A.10	Plan Integration Maturity Evaluation - After implementation of improvement measures	VI

List of Tables

3.1	Interview overview	30
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List of Tables

1

Introduction

In this chapter the background for the thesis, a description of Volvo and a description of the department that the thesis is conducted at is presented, followed by aim, research questions and delimitations.

The thesis was conducted at Volvo Group Truck Operations (GTO), at the Material Management (MM) department, as part of Logistics Services (LS), which at the time of the writing was located at the office at Arendal in Gothenburg, Sweden. The main aim of the thesis was to identify gaps compared to theoretical frameworks and suggest an improvement-plan for the S&OP-process in collaboration with Volvo.

1.1 Theoretical Background

In current business climate, cost reductions have become a very important driver for staying competitive (Bragg, 2010). Companies search with frenzy for opportunities to cut costs. As one big cost post substantiate from inventory carrying, and the ability to tune inventory as created by operations and production with real demand data, it becomes very important to minimise cost related to stock keeping and hence synchronising supply with demand (Grimson & Pyke 2007). As defined by Kathuria et al. (2007), S&OP can be considered as a tool that integrates a variety of business plans, as for example sales-, operations-, and financial plans, into one unanimous plan. The target is to create balance and align goals between the demand and supply plans, and to subordinate it to the company's overall business strategy. It hence comprises of alignment horizontally and intra-functionally as between sales and operations, but also vertically and inter-functionally between different organisational levels like tactical levels of sales and operations, and strategic level management. The definition varies of where S&OP fits in the strategic/tactical/operational scale, and as depicted in this thesis and further explained in the S&OP process chapter in the theoretical framework, S&OP can be allocated in the region of tactical level business plans as defined by Lapide (2011) or preferably as by Olhager and Selldin (2007), both tactical and strategic.

S&OP when depicted as a process, is in this thesis synthesised into five steps: "Product management review" that consist for example of consideration for any new product or production related matters, "Demand Plan" where demand is assessed through market input and forecasts, "Supply Plan" that contain matters related to the Supply situation of inventory, production and purchasing, "Rapprochement" that synchronises the demand and supply plans hence finalising plans of operations, and lastly "Measure, communicate

and implement the plan” where the consensus actions are executed, communicated and measured.

As a complement to the S&OP process, with a maturity framework one can assess the S&OP process through comparison for detecting gaps and discrepancies that can be filled and improved. The synthesised framework in this report consists of five dimensions that describe the different aspects of who does what, which sub-processes that are included, how the process is measured, what tools and IT are used and how well integrated different departments and plans are in the S&OP.

1.2 Company Background - Volvo Group

Volvo Group currently consists of several brands as a result of a rather aggressive strategy of expansion through acquisitions. At the time being for conducting this thesis the Volvo Group composes of various brands and industry branches. Figure 1.1 below adopted by Volvo (2015) describes the brand-structure.

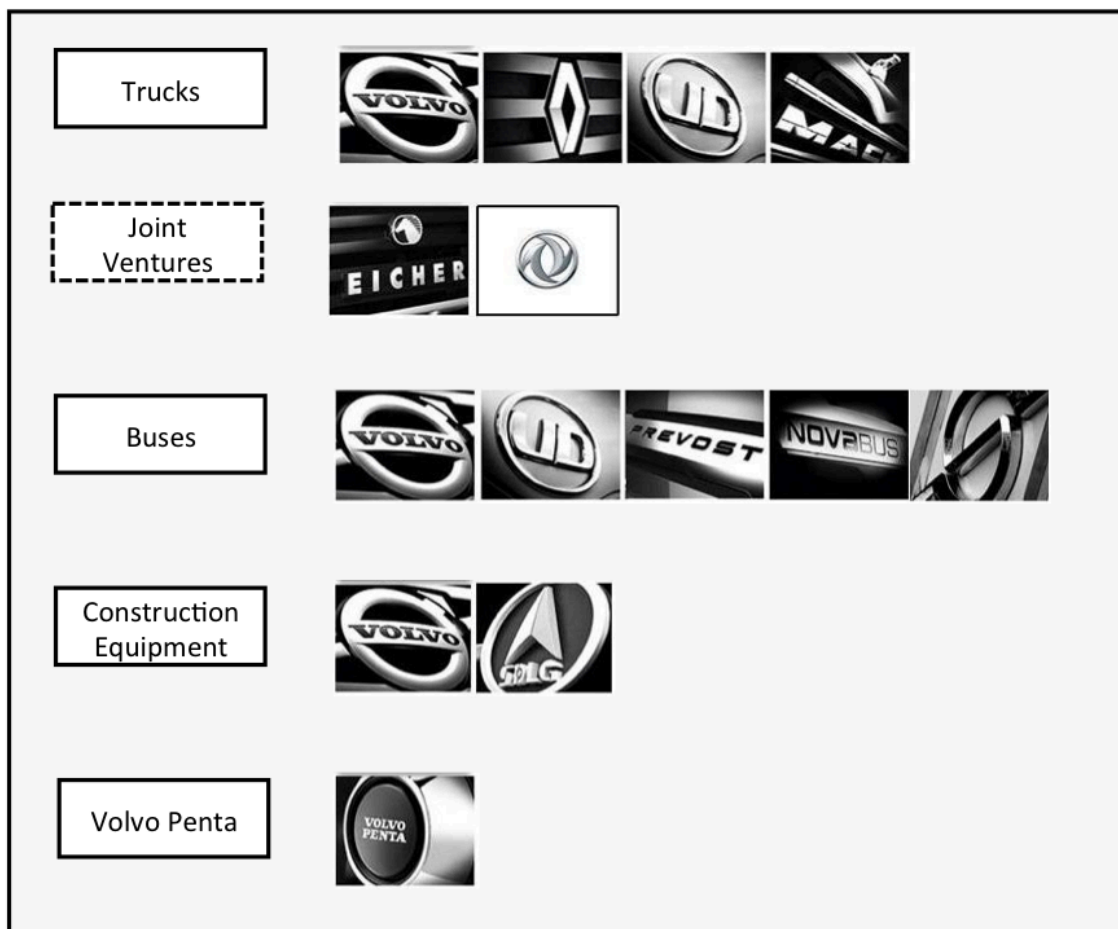


Figure 1.1: Volvo Group Brand Composition

The product offer hence spans from trucks specialised at different regions and markets

of the world as well as price segments, and the same goes for the different construction brands. The Group Trucks Operations (GTO) together with Group Trucks Technology (GTT) and Group Truck Sales (GTS) compose the backbone of Volvo Trucks. Logistics Services (LS) as part of GTO handles logistics development and logistics purchasing as global functions. LS also do Material Management as a global operation, handle order points, manage warehouses and transports of products and parts as regional operations. The supply chain construct of Volvo aftermarket that the S&OP that Material Management aspire to control, and hence this thesis treat, is depicted below in Figure 1.2.

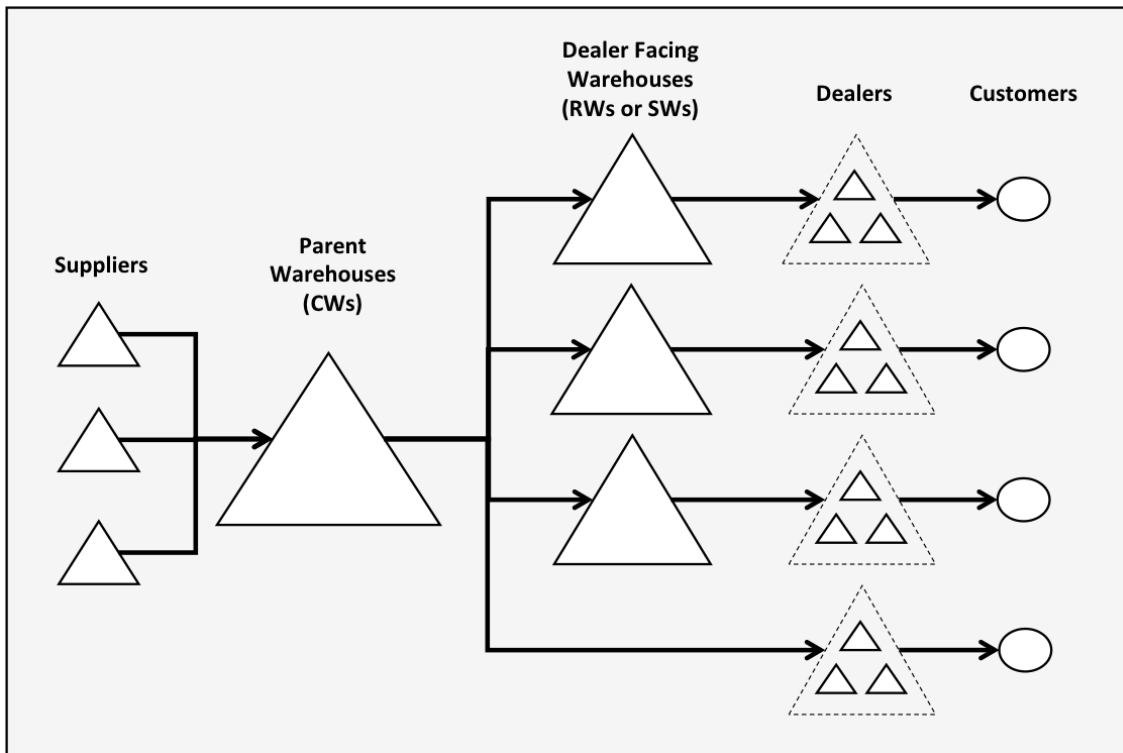


Figure 1.2: Volvo Aftermarket Supply Chain

The Aftermarket division of Volvo Group is as of today already conducting their sales and operations planning (S&OP), which they call “Flow planning”, quite successfully (as according to recent brief benchmarking made by a well renowned consulting firm) but have realised the potential of an even more developed process, and hence wish to improve and proceed to a higher level of maturity of S&OP, i.e. Advanced S&OP. The division at Volvo that the Thesis is conducted at is Logistics Services for Aftermarket, specifically the department of Material Management - Theoretical Optimization for Spare Parts.

Globally Volvo hold meetings for their S&OP every month, and there are three general types of meetings that they use for their planning. First they have meetings with their customers called Dealer Facing meetings where they get demand data. The result of the Dealer Facing meetings gets refined and ready for analysis at Pre-parental meetings or Parental meetings at a higher aggregation level. In these Parental meetings, managers represent different parts of the supply chain and functions within the company for the aftermarket. Discussion is based around how much is to be held in inventories for the

coming period and how well forecasts have performed.

1.3 Problem Identification

As described in the theoretical framework the possible advantages of a successful S&OP is clear (Grimson & Pyke 2007). Efficiently balancing supply with demand, aligned with business strategy, will likely utilise cost reductions and profit optimisation. The S&OP process at Volvo Aftermarket has been internally developed, and therefore the need for external evaluation has been identified, thereby Volvo saw advantages with comparing to theoretical frameworks for enabling further development of their process. To enable the evaluation and prospective benchmarking of the process, the theory provides a common concept of maturity frameworks. Therefore the constructing of an up-to-date framework for S&OP maturity, containing the essences of what makes a successful S&OP-process, is viable. By mapping Volvo Aftermarket's S&OP according to the synthesised framework, discrepancies can be found and an improvement plan can be constructed together with Volvo.

1.4 Aim

The aim of the thesis was to identify and evaluate improvements for the S&OP process at the Volvo Aftermarket division. This could for example include who should attend S&OP meetings, what gets treated on the meeting agendas and what tools the process should utilise to be successful. As noted in following Delimitation sub-chapter, the total time disposed for the thesis set borders for what could be achieved in the given time-frame. The material would then enable them to work with setting a long term plan for what to aim for in their continuous internal improvement work. In order to fulfil the aim, four research questions are to be answered in the thesis. These are outlined in the section Research Questions.

1.5 Research Questions

1. How can S&OP practice maturity be assessed?
2. How is Volvo's S&OP process designed?
3. What performance gaps in Volvo's processes can be identified using a synthesised maturity framework?
4. How can Volvo improve their current S&OP?

1.6 Delimitation

The general structure of the S&OP process at Volvo Aftermarket is globally coherent and cannot really be divided into regional areas since the process does not differ. However, S&OP meetings and data related to those was focused on the European market where a specific selection was made to be able to investigate within the given time-frame. Within the given time-frame limitations the thesis aimed to identify gaps and suggest possible

improvements.

The thesis aims to investigate S&OP processes on a strategic and tactical level, and benchmark against relevant S&OP maturity framework literature. Thus exploration of more detailed and disaggregated data or information was not treated in this thesis.

The total time allocated for the project was limited to the standard time-frame for theses executed on Chalmers (20 weeks), hence the projected finish with hand in of report and final presentations for Volvo Group and Chalmers was allocated in the middle of May and beginning of June. The whole thesis project was though treated as a continuous and dynamic process which means that when the scope could be broadened or in depth analysis could be conjured without substantially affect the time plan, e.g when the the yielded gain is worth the extra paid effort, this was done.

1.7 Overview: Model of Analysis

The chronological manner of conjuring the project, as first researching theoretical frameworks, second investigating the current "as is" situation of Volvo's current S&OP process and third to make conclusive recommendations, mainly follow the common method of abductive research. The abductive research combines deductive and inductive research methods in its chronology (Kovacs & Spens, 2005) and hence provide an efficient and feasible way of ensuring that the project is executed viably. The thesis has a more focus on the deductive approach although there are features of an inductive approach as well.

1.8 Disposition

1. Introduction

S&OP is explained in a summarily matter and some of the context given at Volvo Spare parts as well. Hence, the reader gets a first look at what the thesis is treating and should help in comprehending the material. The Introduction also explain why the thesis is made, the delimitation, research questions, and overall aim.

2. Theoretical Framework

Here the reader is provided with relevant theory through thorough exploration of S&OP. Main takeaways in form of what parameters affect the S&OP, what steps the S&OP process generally consists of, and front and foremost a synthesised maturity framework that is used for evaluating Volvo Aftermarket's S&OP process.

3. Methodology

This chapter provides with the methods used for conducting the thesis, i.e how to reach the aim and answer the stated research questions. Methods for how data collection is conjured and motivation of work process for the project is also presented.

4. Results

Here the generated material from data collection is presented, i.e. interview results,

data from internal presentations and other collection of relevant material made available Volvo. The material mainly consists of data regarding the S&OP process.

5. **Analysis**

The theoretical framework is put to use to make an analysis of Volvo Aftermarket's current S&OP, which in this case specifically means a comparison between the described S&OP parameters, the process and related maturity levels provided by theory. The relevant gaps that are identified are then subsequently systematically prioritised according to how viable filling of a certain gap would be and what outcome it would entail, as for enabling the creation of a structured plan for action.

6. **Recommendations**

With the preceding analysis in mind and for fulfilling the aim with a more practical standpoint, the concluding recommendations for Volvo is summarised and made available in a managerial implications manner.

7. **Conclusion**

The conclusive comments about the result of the thesis in form of research questions, managerial implications, methods and suggestions for further research.

2

Theoretical Framework

In this chapter the reader is provided with the theory in form of some more thorough S&OP knowledge, what steps the S&OP process generally consists of, and a synthesised maturity framework that is used for benchmarking Volvo Aftermarket's S&OP.

2.1 S&OP Context

For this kind of study it is important to understand how a company's context may impact the S&OP process and performance. The contextual areas that are important to study are related to both internal and external variables. Ivert & Jonsson (2014) discuss the complexity of the S&OP process with the use of a definition on supply chain complexity by Bozarth et al. (2009). Bozarth et al. (2009, p. 80) define supply chain complexity as "the level of detail complexity and dynamic complexity exhibited by the products, processes and relationships that make up a supply chain". Detail complexity is further defined as the number of components or parts that make up a system (Bozarth et al., 2009). The dynamic complexity refers to the unpredictability of a system's response to a given set of inputs which is driven by the interconnection of the parts which make up the system. In the S&OP context, detail complexity relates to the number of entities which affect the S&OP process and dynamic complexity relates to restrictions and uncertainties in materials supply, demand and the production system (Ivert & Jonsson, 2010).

In the S&OP context there is a need to account for internal, downstream and upstream complexity. The internal complexity relates to the level of detail and dynamic complexity within a company's products, processes and planning systems (Bozarth et al., 2009). The number of parts within a company is a driver of complexity which can affect performance. Downstream complexity relates to the downstream market where potential drivers of complexity are number of customers, the heterogeneity of customer needs, length of product life cycle and demand variability. The demand variability is a source of dynamic complexity in the supply chain where a lack of coordination in ordering policies can cause fluctuations upstream, while demand varies only slightly over time. The upstream complexity relates to the company's supply base. The drivers of upstream complexity are number of suppliers, lead time, reliability and extent of global sourcing.

2.2 S&OP Definition and Goals

The definitions of a S&OP process vary, but the definition depicted by Lapide (2011) as being a Tactical Planning process where the main internal target is to balance demand

with supply creates a comprehensive illustration, as may be seen in Figure 2.1. At the same time targets for increased profits, inventory decrease or other selected strategic target should still be aimed at. In the end S&OP becomes a way of tying processes of Demand Planning with Supply Planning and balance the inter-dependencies of input and output of these processes, all under order of the Strategic Planning. The Strategic Planning sets the objectives and goals that should be aimed for and optimised towards.

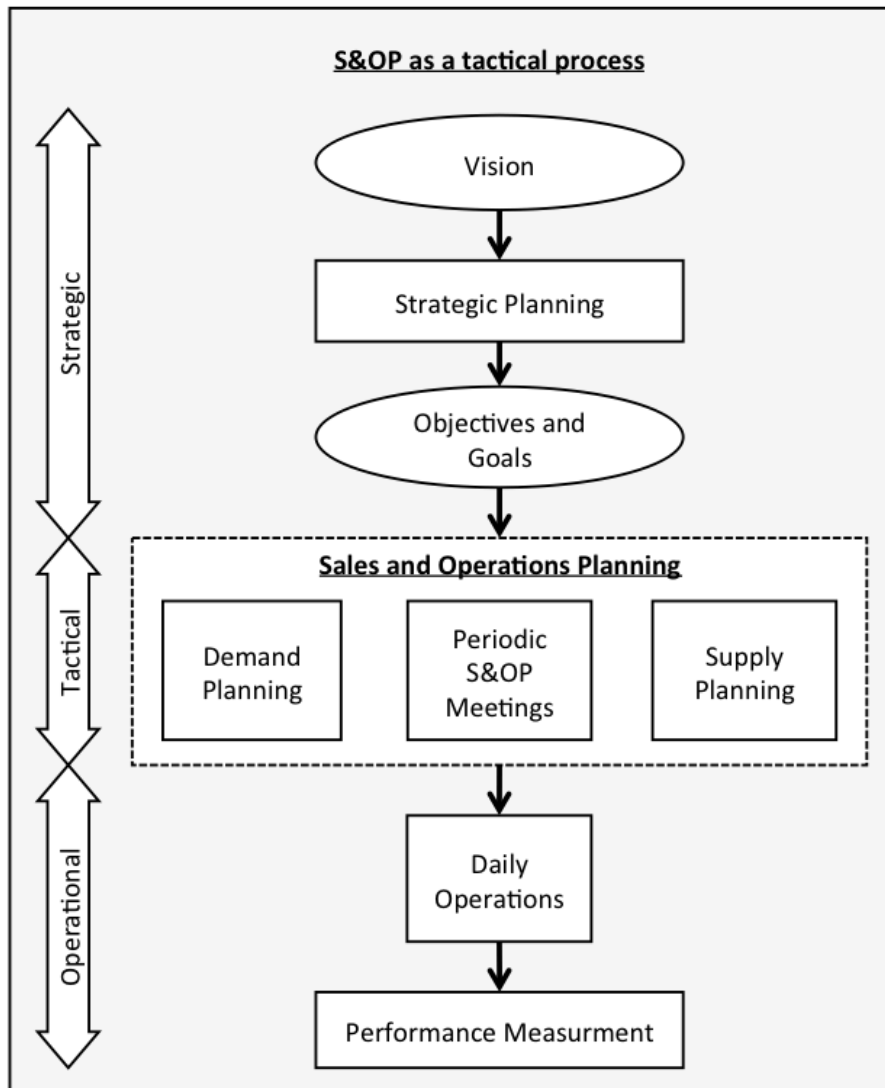


Figure 2.1: S&OP as a tactical process

Jonsson & Mattsson (2009) define S&OP as a process that is used to work out and establish the overall plans for both sales and production operations. The process aims to balance supply and demand in order to optimise the company's efficiency and competitiveness, with a starting point in the overall strategic goals. Goals and plans from different departments are also coordinated in the process as well as any operations that influence or are influenced by material flow and utilisation of resources. S&OP is used as input to more short term planning processes. Master Production Scheduling is set within the decisions made in the S&OP process and is in sequence used as input to Order Planning. After these

processes the procurement of material and execution and control of production takes place.

The production plan and delivery plan are a result of the S&OP process (Jonsson & Mattsson, 2009). The production plan is expressed in volumes to be manufactured per time period while the delivery plan is expressed in volumes to be delivered to customers. The goal of the S&OP process is to balance the demand and supply but there could occur imbalances that have consequences. If demand is to exceed supply the consequences might be loss of sales, lower service level and higher freight costs. In this case revenue and market share might be lost because of the inability to meet demand. In the reverse scenario, when supply exceeds demand, the consequences might be increased tied-up capital, higher inventory costs, higher production cost due to low utilisation and lower revenues due to price cuts and discounts. These consequences affect most departments in the company and these departments in turn might have limitations to how well they can balance the demand and supply requirements, e.g. the financial department might not have the funds to increase stock levels to a desired level.

In following chapters S&OP will be explained more thoroughly as in first what planning parameters are central in the process, what essential steps it comprises of and subsequently how refined the process can be through presentation of a synthesised maturity framework.

2.3 S&OP Planning Parameters

In order to achieve an efficient process for S&OP there are a number of parameters that need to be established. The parameters reviewed in this section are planning horizon, planning frequency, planning objects, units of capacity and time fences.

2.3.1 Planning Horizon

The parameter planning horizon defines how far ahead in the future plans for S&OP are to be made (Jonsson & Mattsson, 2009). Planning as far as possible into the future is not the goal and a forecast is more uncertain with a longer planning horizon. Because of the relationship between S&OP and budgeting, the appropriate minimum planning horizon is a one year's horizon (Jonsson & Mattsson, 2009). If the demand is seasonal it is also important to have at least one year in planning horizon. The length of the planning horizon should be based on how far in advance planning is required to be able to adapt production capacity to changes. Majority of all companies use a planning horizon of one to two years (Jonsson & Mattsson, 2009). According to Grimson and Pyke (2007) the most common planning horizon is 6 to 18 months, with some uncommon horizons being set to longer than a tree year's period. The company's context of industry, product and seasonality affects how long the planning horizon is ranged and varies a lot.

2.3.2 Planning Frequency

The frequency of S&OP meetings is usually on a monthly basis but according to Grimson and Pyke (2007) many companies are moving towards a more frequent meeting schedule. While the common practice is to meet according to a schedule with regular intervals,

companies that strive for an event driven S&OP process hold their meetings based on current exceptional events such as competitor actions or operational problems (Grimson & Pyke, 2007). The frequency of meetings is also dependent on the company's context, i.e. dynamics of the market and production environment.

2.3.3 Planning Objects

S&OP refers to the overall and long term planning and because of that the level of detail in planning should be low when expressing demand and production volumes (Jonsson & Mattsson, 2009). When setting the delivery and production volumes it is generally preferable to express everything at a product group level rather than individual products. The products should be grouped in such a way that the demand behaviour should be as similar as possible for all products within a group. The forecasts are made on aggregated levels which stresses the importance of similar behaviour. Further the products in a group should have similar resource requirements since both demand and resource planning is aggregated, which facilitates material planning and production resource planning.

2.3.4 Units of Capacity

As similar to planning objects, the level of detail in units of capacity should be low as well (Jonsson & Mattsson, 2009). Units of capacity refer to the level of detail in which capacity availability and capacity requirements are expressed. These could be machine hours or man hours, but the unit could also be expressed in a similar manner as the production plan, e.g. volume per month. Depending on the context the units of capacity can be expressed in different ways, where the chosen unit should be most suitable for the given context. In the end there must be a conversion of production volumes into capacity requirements and this is achieved with the use of a capacity bill.

2.3.5 Time Fences for Changes in Plans

A typical frequency for S&OP is on a monthly or quarterly basis where changes can be made (Jonsson & Mattsson, 2009). When new production plans are being made, old plans are still in use which have controlled the size of capacity and procurement of materials. Since both of these take time when making changes it becomes hard to change production volumes at short notice. The time when no changes can be made are tied to the length of lead time for procurement of material as well as for manufacturing, while also being dependent on the flexibility of operations. To handle these situations in practice a company can apply time fences for when changes are allowed to be made and by how much the production can change. The size of the time fences and changes allowed is dependent on the context of the company and the cost it may incur for these changes.

2.4 S&OP Process

The S&OP process is described stepwise by several authors (AMR Research, 2009; Jonsson & Mattsson, 2009; Grimson & Pyke 2007; Schorr 2007) usually including five steps, except for AMR Research (2009) which includes nine steps. According to Schorr (2007)

2. Theoretical Framework

the first step should be to review the product portfolio followed by creating the demand plan, developing the supply plan and a rapprochement meeting as suggested by other authors (AMR Research, 2009; Jonsson & Mattsson, 2009; Grimson & Pyke, 2007; Schorr 2007). The final step is suggested to be to communicate, implement and measure the plan (AMR Research, 2009; Schorr, 2007). These five steps are then synthesised from the relevant theory through a literature review (Webster & Watson 2002), used to categorize the different steps of the authors included as can be seen in Figure 2.2 below.

Step	AMR Research	Jonsson & Mattsson	Grimson & Pyke	Schorr
1 Product Management Review				1. Product management review
2 Demand plan	1. Collect sales and market input 2. Develop a demand plan 3. Demand consensus refinement 4. Shape demand based on what-if analysis on demand for supply	1. Forecast future demand 2. Produce preliminary delivery plan	1. Create unconstrained demand forecast	2. Demand review
3 Supply plan	5. Develop a constrained plan by supply 6. Conduct a what-if analysis by supply to determine trade-offs on measurements and identify demand-shaping opportunities	3. Produce preliminary production plan	2. Create initial supply plan	3. Supply review
4 Rapprochement	7. Review and gain agreement through a consensus meeting	4. Adapt delivery and production plan 5. Establish delivery and production plan	3. Develop a final operating plan	4. Integrated reconciliation meeting 5. Senior management business review meeting
5 Measure, Communicate and implement the plan	8. Publish the constrained plan 9. Measure and communicate the plan		4. Distribute and implement plan 5. Measure performance of process	

Figure 2.2: S&OP process synthesis

2.4.1 Step 1: Product Management Review

Both Grimson & Pyke (2007) and Schorr (2007b) emphasise the importance of integrating product introduction in the initial steps of the S&OP process, whereas Grimson & Pyke (2007) chose to include it in the step of creating an unconstrained demand forecast and also suggest considering obsolescence rate of products. Schorr (2007b) present this process step extensively and include matters like technology, new launches, rationalisation or changes of products and processes and any other measure or activities that could affect the internal functions of supply, demand or financials. The result would be a documented plan for the potential new releases or activity changes, and what resources that are necessary to set these in action. By integrating this step in the S&OP process, management can assure that the flow of new product releases for example are meeting the goals as generated in the business plan, i.e aligning available demand with the strategic targets and what would be possible to supply.

Typically, products that align well with the business strategy get prioritized and management investigate whether it would be the best use of available resources. Then they are set

through a stage gate process with project checkpoints that ensure project compliance and aid in the development decision process. When the product plan is set Schorr (2007b) then suggests using rough cut capacity planning to ensure the availability of resources. Generally, the Product Management Review Meeting process is owned by the product development or marketing head and facilitated by a product coordinator that prepares necessary input data prior to the meetings. As illustrated in Figure 2.3 adopted from Schorr (2007b) the input for the Product Management Review meetings are data related to brand strategy, new products or processes, project statuses, marketing and promotion initiatives, change activities, resource requirements etc. The product coordinator then assembles the input and prepares for the New Product Review meeting. Common outputs that get forwarded to the next Step of the S&OP process are new activity plans, requests, changes, managed resources, risks etc.

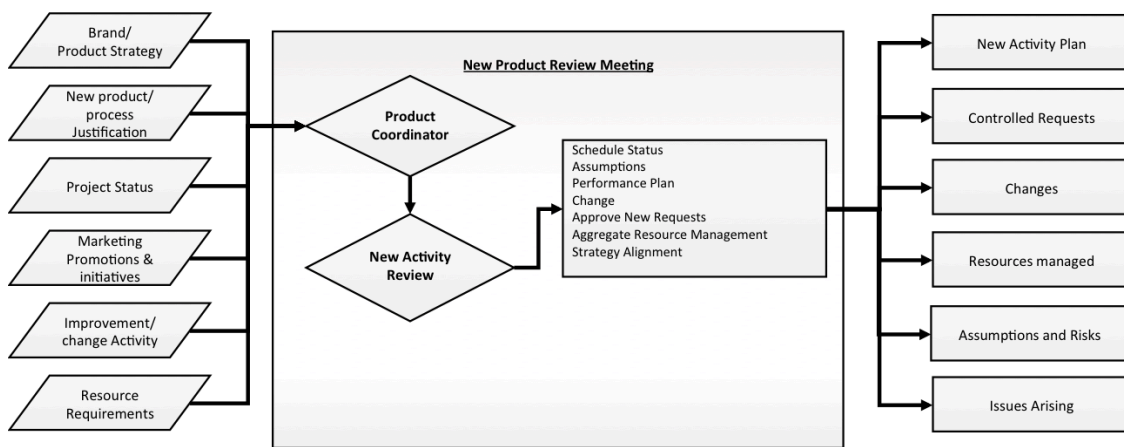


Figure 2.3: New product review meeting, as adopted by Schorr (2007b)

2.4.2 Step 2: Demand Plan

Jonsson and Mattsson (2009) suggest to begin with forecasting future demand, which normally is done by the sales and marketing department. Final forecasts should be presented on product group level and extend over a relatively long period into the future, although forecasts might initially be made on article level in order to aggregate on group level. Grimson and Pyke (2007) suggest that personnel gather in pre-meetings in order to build an unconstrained demand forecast based on what could be sold to customers, not what the company is able to produce. Both new and existing products should be included in the forecast (Grimson & Pyke 2007; Schorr 2007c). The unconstrained demand forecast becomes the basis for delivery planning. In order to create a demand plan both statistical analysis and input from management can be used for forecasting (AMR Research, 2009). According to Grimson and Pyke (2007) the most common planning horizon is 6-18 months but this can vary by industry. Some companies use a rolling horizon and update forecasts and plans at the formal S&OP meeting. The statistically generated forecast can be compared to the collective sales forecast and key supply chain partner forecast to understand and analyse exceptions (AMR Research, 2009). The outcome of this collaborative forecast can be used for demand plan shaping.

The sales and marketing department should prepare a preliminary plan for delivery volumes while previous sales and delivery plans should be compared with what was actually delivered (Jonsson & Mattsson, 2009). Further, goals are established for inventory size or order backlog. In order to create a complete demand plan it should be linked to units and financial metrics which can be analysed in different scenarios (AMR Research 2009). These scenarios could include promotions, changes in price and timing of new product introductions. These scenarios and the analysis made should be paired together with the forecast when creating the supply plan.

2.4.3 Step 3: Supply Plan

According to Jonsson & Mattsson (2009), step 3 considering Supply planning, begins with the creation of a production plan. This originates from volumes that need to be produced and any purchasing that need to be executed. AMR Research (2009) on the other hand emphasize using the forecasting and demand data generated in previous S&OP steps and analyse what production plan that generates best revenue, return on assets, profitability or service and that it is necessary to define whatever demand shortfalls, constraints and other capacity opportunities that would help the decision process during the supply meeting. Grimson & Pyke's (2007) interpretation of the supply plan comprise of supply chain, internal and inventory strategies that the operations team align with sales forecasts generated in previous steps, and they mention the use of MRP-planning as a tool to ensure deliverability and create production schedules. Grimson & Pyke (2007) then suggest, still in the supply plan step, that the operations team use the demand data acquired from the sales department to make an initial supply plan, i.e often a Rough Cut Capacity Plan (RCCP). Schorr (2007a) also mention the use of RCCP and propound that alternative for supply plans and a proposed plan would be an output of this step, and subjects like capacity, hedging, available materials, improvement plans and flex potential get treated in the process.

2.4.4 Step 4: Rapprochement

A rapprochement meeting is taking place between managers from marketing, production, procurement, financial and logistics department to establish a proposal for the delivery and production plan (Jonsson & Mattsson 2009; Grimson & Pyke 2007). The proposal is then put forward to the top management group where unresolved issues are considered and an agreement is reached on the delivery and production plan. At this level different scenarios need to be reviewed and decisions need to be made on pricing and capacity trade-offs (AMR Research, 2009).

The rapprochement step uses plans developed from the previous steps including product management review, demand plan and supply plan (Schorr, 2007e). These plans are then linked to financial aspects, gaps to strategic plans are identified, alignment to business plan is made, important KPI's are reviewed and recommendations of gap filling actions are presented. The output is then brought forward in a S&OP packet which is used to facilitate the S&OP review. It is important to link finance to the plan because without the link the S&OP discussion becomes a tactical instead of strategic business discussion. The senior management business review meeting uses the S&OP packet as input as well as

business trends, key issues to be reviewed, decisions required and the latest view of the alignment of the business in regard to the strategic and annual business plan. The output of this meeting is an agreement on a set of numbers, a rolling business plan for the coming planning horizon and valid performance measurement.

2.4.5 Step 5: Measure and Communicate the Plan

The last step of the S&OP process treats implementation and performance measurement. AMR Research (2009) suggests that first to publish the created constrained plan, hence communicating it for execution to finance and operation teams. Secondly after execution and during the forthcoming month conduct measuring like cash-flow, actual revenues, cost, inventories, profitability, customer service and forecast accuracy. Similar final step content is presented by Grimson & Pyke (2007) which suggest in their step 4 to distribute the plan for execution to operations and sales teams, though mentioning the operations team generally being the instance required to conform, and that sales teams infrequently have to change their sales plans. Grimson & Pyke's (2007) step 5 then also concludes the process with the measuring of efficiency and effectiveness of S&OP for enabling continuous improvement. Common measures they mention generally relates to sales, operations, product development or finance with varying focus that would depend on the business context and objectives of the certain company.

2.5 S&OP Maturity

To enable evaluating and benchmarking of S&OP processes, the literature offer various ways of measuring process maturity. Different frameworks as synthesized from executive reports and interviews propose a way of defining how well a certain company are doing in comparison to its peers, but also where discrepancies or gaps can be filled to excel in S&OP and hence increase profit, cut cost or tied up capital depending on company strategy. The models that subsequently are presented and synthesized for use in the benchmarking process, all substantiate from similar bases of company dimensions and different maturity stages.

Grimson & Pyke's (2007) maturity framework have been established as one of the most cited (Thomé et al., 2012) and comprise of a synthesis of previous established maturity frameworks, hence this make for a good foundation to build upon. Grimson & Pyke's article was published in 2007, and since then there have been new publishments of frameworks, of which elements in this case have been used to complement Grimson & Pyke's (2007) to make it as complete as possible. As for the other contributors, Lapide (2005) partially cited by Grimson & Pyke (2007), adds to the completeness of the framework in form of meeting scheduling factors, empowerment of S&OP participators and information sharing between SC-partners. Wagner et al. (2014) make extensive additions to the organisational and measurement dimensions, and as being published later in the near history, levels of IT-integration that is demanded to be best in class have been increased. AMR Research (2009) contribute in addition to the 9 step S&OP process presented in previous chapter, by a selection of recommended KPIs for the stated maturity stages. Bower (2005)

contribute with certain pitfalls that the implementer of S&OP should avoid for some of the different S&OP dimensions presented.

2.5.1 Meetings and Collaboration

Meetings and collaboration is a dimension of the Grimson & Pyke (2007) maturity model which aims to evaluate the effectiveness of the human participation in the S&OP process. In Stage 1 there is a silo culture where personnel from sales and operations work independently from each other. Further they have no meetings and no collaboration. Forecasts are usually poorly developed that may be inflated from the sales personnel and adjusted from the operations personnel. Goals are developed with no clear understanding of the market, production capacity or inventory positions. In Stage two the sales and operations are discussed at a top level management meeting, with a focus on financial goals and not integrating plans. The silo culture is present at this stage as well with little collaboration among employees. The focus on financial goals can drive sales efforts, pricing decisions and promotions without really understanding the effect it has on the market or operations. In addition to this Lapide (2005) mentions, as characteristics for early maturity, that the nature of meetings scheduled are sporadic and badly organized on which members might skip out on due to their consideration of other tasks being more important. This is a mindset common in the siloed organization. At Stage 3 the processes of S&OP become formalized (Grimson & Pyke, 2007). Pre-meetings are held between sales and operations personnel where they may share information from their plans. Then formal executive S&OP meetings are held which focus on integrated S&OP and unresolved conflicts can also be addressed. In these meetings some specific supplier and customer data may be used. At this stage the process and attendance has evolved, but the participants level of effort in preparing for the different steps of the process is lacking (Lapide, 2005). A higher frequency of meetings is a part of the more mature stages. Stage four is extended from the previous stage three, to include the top customers and suppliers in meetings (Grimson & Pyke, 2007). While in Stage three major supplier and customer data is used, in Stage four a broader set of supply chain partners are invited to participate and engage in the S&OP process. Stage five is a further extension of Stage four with the addition of event-driven meetings that can supersede the scheduled meetings. In case of shortage of a critical component the S&OP team will meet instantly instead of waiting for the scheduled meeting. At this stage real-time internal and external data would be available to both internal personnel and supply chain partners. The main advantage of Stage five is the S&OP team can get early warning signals about upcoming disruptions and be able to take appropriate actions. Lapide (2005) suggests that meetings can be kept at a minimum as the extensive integrated software-structure for supply, demand and S&OP would likely handle the day to day operations related to S&OP. The meetings that occur are aimed at being event-driven in case of sudden changes or new product introductions.

Bower (2005) explains that since the purpose of S&OP is to consider future portfolio, demand and supply requirements, the best way to develop accurate plans is by consistently examining actual results on an ongoing basis. This way insights can be gained of potential trends and when there are gaps between supply and demand these can be addressed proactively. The S&OP process is a routine and reducing the frequency of monthly meetings

2. Theoretical Framework

can only be justifiable in some special cases. According to Bower (2005) the only way of being sure that the organization is advancing towards achieving its goals is through the discipline of conducting S&OP meetings and reviewing performance metrics on a monthly basis. Bower (2005) further puts importance to the S&OP meetings by mentioning that little understanding of proper meeting procedures is one of twelve pitfalls of the S&OP process. Lapidé (2004) also underlines the importance of S&OP meetings by linking seven out of twelve S&OP success factors that are directly related to the Meetings and Collaboration dimension of the Grimson & Pyke (2007) maturity framework.

Lapidé (2004) mentions decision making as one of his success factors. Since participants in the S&OP process need to make decisions on operational plans and forecasts they need to be empowered by the executive team to make decisions during the meetings. The meetings need to achieve closure and having to go back to the executive team to get an approval should not be an option. Bower (2005) lists senior management indecision as one of the twelve pitfalls for the S&OP process. Lack of decision making does not add benefit to the organization and leads to a low return on time invested during the S&OP meetings. AMR Research (2009) suggest that the S&OP process and decision making needs executive sponsorship and participation of senior executives in S&OP meetings. While the meetings can involve senior managers most executives empower their subordinate directors to attend meetings and take decisions on their behalf (Lapidé, 2004). Following Figure 2.4 summarise the maturity stages for the Meetings and Collaboration dimension.

Meetings and Collaboration

Stage	Grimson & Pyke	Other
1	- Silo culture - No meetings - No Collaboration	
2	- Discussed at top level management meetings - Focus on financial goals	- Lapidé (2005): Chaotic and sporadic schedule for meetings, that get frequently cancelled. - Lacking effort for preparation of material
3	- Staff Pre-meetings - Executive S&OP meetings - Some Supplier/Customer data	- Lapidé (2005): Increased meeting frequency
4	- Supplier & Customer Data incorporated - Suppliers & Customers participates in parts of meetings	
5	- Event driven meetings supersede scheduled meetings - Real time access to external data	- Lapidé (2005): Keep meetings at a minimum and let S&OP Workbench initiate event-driven meetings when necessary.

Figure 2.4: Meetings and Collaboration Maturity Model

2.5.2 Organisation

The organisation dimension of Grimson & Pyke's (2007) maturity model treats the corporate structure of the S&OP. At stage one there is no S&OP structure at all, either in itself or as part of any other organisational substructure and no-one is aware of the concept, process or its advantages. At stage two some of the related S&OP tasks like sales/operations

alignment get executed in other business functions un-knowingly or not, although not in a formal manner. At stage three of the maturity scale for the organisation dimension the S&OP process gets executed by some other corporate function like the sales or product manager. There is no formal S&OP team, however there might be a formal team doing some of the related tasks. At Stage four the S&OP process is conducted by an organisational entity with responsibility and ownership, hence a fully formal S&OP team. There should also for full stage four completion be apparent executive level participation in the process. The members of the S&OP team all have S&OP-related functions clearly stated in their responsibilities. Lastly, stage five, the process is executed fairly the same as in stage four although the process is widely comprehended and recognized as important as the process leads to a more efficient way of conducting the business and used as a driver for higher profit.

As stated by Lapide (2005), in addition to the Grimson & Pyke (2007) model, the organisation at the higher stages of the process are more cross-functionally aligned, and the attendees of meetings are well empowered in their business area. Similarly, according to Wagner's (2014) maturity stages, the empowerment and authority of the S&OP attendees increase gradually, making them able to make the decisions necessary for running the process appropriately. At the final stage Lapide (2005) emphasizes the supply chain integration and the collaboration with suppliers and customers, and the seamless flow of collaborative data into and between the separate entities' ICT-systems. Companies in advanced stages of S&OP have strong executive sponsorship (AMR Research, 2009). The larger the company and the more complex environment the greater the need for executive sponsorship. Wagner et al. (2014) add to the framework by discussing a dimension of knowledge level regarding S&OP, role definition and how appropriately the accountability and empowerment of the participants are. At higher stages there is clear that the S&OP process need a clear owner and elaborate executive support to be successful. The knowledge level of higher stages also include know-how of other factors that is included in and affect the S&OP process, like Risk management. At the highest stage Wagner et al. (2014) proclaims that the integration between the organisations in the SC is more developed and refined, and that the whole firm with employees and executive and also other SC-tier partners strive for continuous improvement of the S&OP process. According to AMR Research (2009), the greatest cultural barrier to overcome is the role of finance and how to use financial budget in the development of the plan. In demand driven S&OP the budget is an input to the plan and doesn't constrain it. The second largest cultural barrier is the role of sales. A common mistake in S&OP is the belief that sales knows what the organization should be selling, which is naive since the sales force has bonus incentives. Aberdeen Group (2013) name organizational capabilities and some issues which stand out related to talent and training. Specifically related to the S&OP process, Aberdeen Group (2013) mention scenario planning skills, which relates to using tools effectively and addressing the "what if" questions when looking at alternatives and trade-offs. Recognizing and providing alternatives is key in defining trade-offs and thus achieving the right balance between supply and demand, which is a goal of the S&OP process. Following Figure 2.5 summarise the maturity stages for the Organisation dimension.

Organisation

Stage	Grimson & Pyke	Other
1	- No S&OP organisation	- Wagner et al. (2014): Lack of Know-How
2	- No formal S&OP organisation - Components of S&OP in other positions	- Wagner et al. (2014): S\&OP affiliates are yet not empowered to make any affecting decisions. - Roles are not clearly defined. - People are not held accountable for plans and performance, lack of ownership. - Little to no executive support - Low knowledge about the process and how to execute.
3	- Formal S&OP is part of other position: Product manager, Supply manager, but there is not a dedicated team.	- Wagner et al. (2014): Typically empowered attendees. - Partially accountable participators. - Clear S&OP-process owner.
4	- Formal S&OP team - Executive participation	- Lapide (2005): Cross-functional and empowered attendees. - Wagner et al. (2014): Sufficient Know-How to execute advanced S\&OP and additional activities like Risk management
5	- Throughout the organisation S&OP is understood as a tool for optimizing company profit	- Lapide (2005): High level of supply chain integration, whereas collaborative input is automatically drawn from customers and suppliers detecting imbalances - Wagner et al. (2014): Top management commitment both internally and from SC-partners. - Employees and management continuously strive for improvement

Figure 2.5: Organisation Maturity Model

2.5.3 Measurements

Grimson & Pyke (2007) generalise the Measurement dimension by saying it covers both measurement and performance of the S&OP process as well as the overall company performance, and begin with the conclusion of Stage one comprising of no continuous measurement at all but standard financial accounting. The lack of information and performance hence of course yields difficult positions for accurate decision making, and the old adage that you cannot improve what you cannot measure describe the situation. Wagner et al. (2014) describes KPIs at this stage as defined but only sporadically managed and in lack of alignment across departments, business strategies and bonus schemes. At maturity Stage two the company has started measuring how well operations are able to align with the sales targets, although an issue is that there is no clear ownership or responsibility of the sales plan (Grimson & Pyke, 2007). Operations is hence forced to follow the sales plan, and the information flow generally is asymmetric as in sales orders or plans transferred to operations. Most KPIs are aligned across departments and there is some effort of tracking performance (Wagner et al., 2014). Stage three companies have started measuring the forecast accuracy as well as the sales-operations responsiveness, and by having managers being responsible for the forecast accuracy the operations can improve pro-active planning and decrease reactive and costly measures that historically have compensated for bad forecasts (Grimson & Pyke, 2007). There is now a structured mechanism for performance evaluation with regular reporting and tracking of performance (Wagner et al., 2014).

At Stage four the implications that are related to the introduction of new products are

considered in the S&OP agenda and the company have started measuring the effectiveness and efficiency of the these, like for example cost for development activities, time-to-market and number of successful introductions (Grimson & Pyke, 2007). Stage four companies should also have begun measuring effectiveness and efficiency of the S&OP process, which would include framework for feedback evaluation to and from S&OP-process participants, and also feedback and insight to and from key customers and suppliers that are integrated in the process. At this stage there is also a full alignment of KPIs across departments, with business strategy and bonus schemes, while internal S&OP benchmarks are irregularly performed (Wagner et al., 2014). Related to Stage four, Grimson & Pyke (2007) furthermore state that functional measurements might very well act as a good way of measuring the S&OP effectiveness. Stage five companies have added the ingredient of financial measurement and are at this stage able to connect decisions and other measurements to financial outcomes. The refinedness of the S&OP software system enables the optimisation of operations and sales according to chosen variable or index, like profit, cost, revenue, tied up capital and so on. The key here is also to tie the S&OP team to measurements of efficiency and make them accountable and strive for improvement. Hence, for example, operations and sales teams could consider overall company profit on an aggregated level instead of their specific branch and KPI's only. KPIs at this stage also consider the performance of supply chain partners and are aligned with payment modes (Wagner et al., 2014). Internal as well as external S&OP benchmarks are regularly performed at Stage five.

The performance of the S&OP process should be measured, like any other process, so it can be improved over time (Lapide, 2004). Bower (2005) describes failure to measure as a pitfall for the S&OP process. The companies that embrace measurement in their S&OP process are able to work better with continuous improvements in contrast to the companies which resist measurement. Measurements are vital to success and can clearly illustrate progress of the team's effort. While it is important to measure the S&OP process too many metrics can be counterproductive to the S&OP team (AMR Research, 2009). AMR Research (2009) mention, in addition to the Grimson & Pyke's maturity model (2007), certain KPI's for the stated maturity stages. Silo characteristic use of order fill rate, inventory levels and asset utilisation is related to premature processes and non-balanced S&OP. At a higher balance stage in addition to order fill rate, forecast error and inventory turnover rate gets more focus. Demand error, customer service, working capital and total costs would be part of the standard S&OP maturity stage while demand risk, customer service, cash flow, market share, and profit become parts of the final almost fully balanced stage. The following Figure 2.6 summarises the maturity stages for the Measurements dimension.

Measurements

Stage	Grimson & Pyke	Other
1	- No measurement	
2	- Measure how well operations meets the sales - Asymmetric information flow between sales and operations. Operations are limited to adapt.	- AMR Research (2009): Order fill rate, inventory levels, asset utilisation - Wagner et al. (2014): Non-aligned Basic KPIs that are sporadically measured.
3	- Sales measured on forecast accuracy	- AMR Research (2009): Order fill rate, forecast error, inventory turnover rate - Wagner et al. (2014): Partially aligned KPIs, that are measured regularly, with some incentives that are related. - Inconsistent S&OP efficiency measuring
4	- New product introduction - S&OP Effectiveness	- AMR Research (2009): Demand error, customer service, working capital, total costs - Wagner et al. (2014): Full alignment of KPIs cross-functionally and bonuses that are related. KPIs for S&OP efficiency. - Irregular internal S&OP benchmarking.
5	- Company profitability	- AMR Research (2009): Demand risk, customer service, cash flow, market share, profit - Wagner et al. (2014): KPIs that also accounts for SC-efficiency and efficiency of SC-partner tiers. - Regular Internal and external S&OP benchmarking.

Figure 2.6: Measurements Maturity Model

2.5.4 Information Systems

As depicted by Grimson & Pyke (2007) stage 1 of information system maturity reveals the use of a sparse and unorganised selection of spreadsheets at most, which are non-shared over silo borders, and the information is non-consolidated. By evolving to stage 2 the separate information clusters generated by each manager could get, manually and scarcely, consolidated. At stage 3 the internal information sharing is rather standardised and centralised and may occur in an automatic process, that gets supported by various operations and sales software. Stage 4 companies start utilising certain S&OP software called S&OP Workbench, that tie operation, and sales software suits together as illustrated in Figure 2.7, with ERP, MRP systems etc. Simply put, the S&OP Workbench is a system where sales and operation information gets consolidated and made available throughout the firm, generally on a batch basis. Stage 5, as of the date for Grimson & Pyke (2007) article publishing, was appreciated to be virtually impossible to achieve due to software and hardware sophistication limits. Here the software structure would enable real-time processing and optimisation of both sales and operations, and in case of any sudden input changes like order costs, currency, overall economic climate etc, the system could recalculate best new solution based on scenario and desired optimisation variable like profit, suggestively.

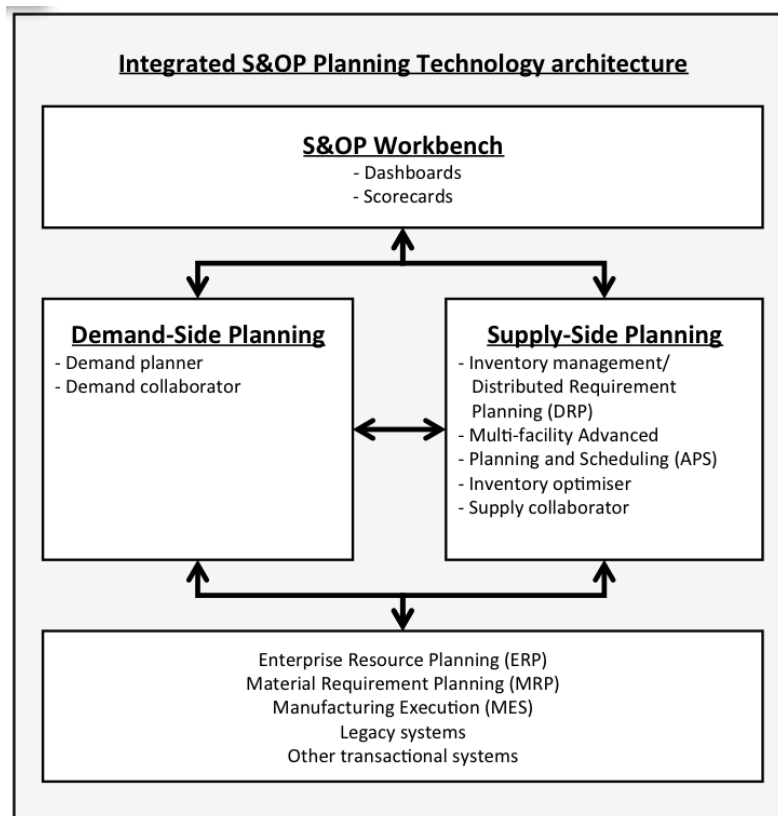


Figure 2.7: S&OP workbench, adopted from Lapide (2004)

Wagner et al. (2014) being published later than Grimson & Pyke (2007) add to the IT-dimension, as in how the software suite including the S&OP workbench react at higher stages, where unexpected deviations should happen this triggers an alert that should be dealt with, and also suggest new scenarios with proposed actions and optimisations. The integration both intra- and inter-company is highly developed and connectivity and transfers should be seamless at the highest stage of maturity. Wagner et al. (2014) discusses that IT is important in enabling S&OP and achieving all of its benefits. Its importance grows in the more advanced maturity levels where access to and monitoring of data is needed to progress in the S&OP process and analyse different scenarios. Further IT is needed to integrate with partners in the supply chain in order to have access to real time data in the more advanced stages of maturity. AMR Research (2009) suggest that IT should be designed to enable collaboration and support the different roles. Lapide (2004) lists IT integration as one of the S&OP success factors where it is mentioned that supply side software needs to be integrated with demand side software to fully support the S&OP process. To integrate these sides a S&OP workbench software is needed to bring the two views together in order to support S&OP meetings. Lapide (2004) also highlights the importance of being able to collect data from customers and suppliers in order to support the S&OP process.

Lapide (2004) explains that the S&OP process needs to be supported by three software applications. These are demand-side planning, supply-side planning and a S&OP workbench. These need to be integrated with each other and also other transactional business systems such as Enterprise Resource Planning, Manufacturing Execution and Material

Requirements Planning. The demand-side planning software support the development of a demand plan and an unconstrained baseline forecast which are to be used as inputs to the S&OP process. Users need to be able to generate statistical forecasts based on internal and external variables which can impact future demand. These variables can be promotional campaigns, new product introductions, pricing strategies and a changing competitive environment. To incorporate market intelligence into the baseline forecast there is a need of a “Demand Collaborator” system. This system captures, assembles and processes the market intelligence from a variety of sources, both internal and external. To enable information collection from external sources, such as customers, the software is usually web-based to transfer data easier. The supply-side planning system helps in generation of inventory, production and procurement plans to best meet the unconstrained baseline demand forecast. These supply plans might constrain the demand forecast when there is not enough supply capacity. In a constrained supply environment Advanced Planning and Scheduling systems can be used to develop more accurate plans that take into account limitations in plant and distribution capacity and also for any shortages in resources or materials. Inventory can be optimized based on the trade-off between customer service level targets and material or finished goods inventory. A “Supply Collaborator” tool is used to gather data from several sources such as purchasing personnel or suppliers. To enable easy access to the system it is usually web-based. The S&OP workbench system enables information to be shared in cross-functional S&OP meetings. The workbench can show multiple metrics that are linked to the planned supply and the unconstrained demand plan, such as critical component shortages and expected customer order backlog. The workbench can also allow for scenario analysis regarding potential changes in supply or demand plans. The workbench also shows important KPIs that reflect on how well the process has been working. These KPIs can include forecast accuracy, variance to baseline forecast and adherence to both supply and demand plans previously put in place. The workbench needs to be integrated with the supply and demand software to take into account any changes made in plans during or between S&OP meetings.

Ivert & Jonsson (2009) relate some benefits to the use of an Advanced Planning and Scheduling system (APS) in the S&OP process. In the first and second activity of S&OP, creating the sales forecast and delivery plan, the APS can support statistical forecast methods and demand planning tools integrable with other departments or companies. The potential benefits of the APS here are that it results in a reliable demand plan, visualization of information and good knowledge about the supply chain. In the third activity, creating a preliminary production plan, the APS system can optimize production plans as well as conduct what-if analysis when demand is changing. The potential benefits of this are that it results in an optimal production plan, allows quantifiable what-if analyses and makes it possible to analyse future events. In the fourth and fifth activity, adjust and settle the production plan, the APS system can optimize the production plan where the potential benefits are that it gives a common and optimal production plan while simplifying planning activities. Another activity is the S&OP meeting with the aim of identifying risks and discussing upcoming and unsolved issues. The APS system can provide with visibility of information in the S&OP meetings. The potential benefits here are the possibility to analyse the problem as a whole, identify and analyse future events as well as making access to information easy. Following Figure 2.8 summarise the maturity stages for the

Information Systems dimension.

Information Systems

Stage	Grimson & Pyke	Other
1	- Individual managers keep own spreadsheets - No consolidation of information	
2	- Many spreadsheets - Some consolidation but done manually	
3	- Centralised information - Revenue or operations planning software	- Lapide (2005): Collaborative information from important customers or suppliers presented at meetings - Sales' software connected with operations' though not concurrently optimised - Wagner et al. (2014): Inconsistent and manually entered data from other systems, which is not entirely harmonised throughout the organisation.
4	- Batch process - Revenue & operations optimization software - link to ERP but not jointly optimised - S&OP workbench	- Wagner et al. (2014): Automatic plan adjustments. Harmonised Master data throughout the organisation. - System triggers automatic alerts in case of unexpected deviations
5	- Integrated S&OP optimisation software - Full interface with ERP, accounting, forecasting - Real time solver	- Wagner et al. (2014): Supply chain partners integrated in system. All relevant data available(incl third party capacity data) - IT-systems completely aligned throughout the SC.

Figure 2.8: Information Systems Maturity Model

2.5.5 S&OP Plan Integration

S&OP plan integration as Grimson & Pyke (2007) interpret it, simply is the measure of how well the S&OP integrate sales and operation plans. The integration is the main target with all the meetings, measuring, organisation and ICT systems depicted until this point in the maturity framework. At stage one operations and sales are unaligned and communicate scarcely, hence are operations reactively trying to reach whatever sales have produced in form of incoming orders without the use of sales forecasts. At stage two operations take back on the sales plan, although capacity utilisation dynamics and optimisation of operations gets neglected when the sales plan is developed. At stage three the sales plan still is the main driver although it is formed with the adding of some operational constraints in consideration. The forecasts are also created in a bottom-up, or grass root way, rather than top-down and sequentially readjusted according to financial goals and business plans, hence entailing better holistic intra-company alignment. At stage four the planning process have evolved into being more of a continuous process rather than sequential, and sales, operations, and to some extent also finance, take capacity limitations in consideration as creating their plans in collaboration. At stage five the process has become even more concurrent, and with the adding of optimisation of profitability. The process is continuous as in that optimisation gets executed unceasingly, and at this point various constraints is applied to do that, as for example inventory, pricing and supply chain constraints. Grim-

2. Theoretical Framework

son & Pyke (2007) suggest that companies that are aiming for stage five could see to that the participating S&OP team managers are able to get their issues lifted and dealt with, whilst maintaining profit optimisation stance. To make the transition they also suggest that top management get involved in the process, as to be able to make likely necessary incentives changes. Related to plan integration, Wagner et al. (2014) add to the insights regarding what input data the S&OP process get at the different levels of maturity, i.e. what is used to drive the optimisations. At early stages Wagner et al. (2014) mention new products, life cycles, capacities, price changes, risk management, and promotions that generally are being planned, but not incorporated in the S&OP process. At next level stage same variables get somewhat incorporated but insufficiently integrated in the process. Lapide (2004) sees importance in the presence of members from finance in S&OP meetings. AMR Research (2009) gives further importance to this by explaining that the greatest cultural difference to overcome is the role of finance and how the financial budget should be used when developing plans. The budget should be used as an input to the plan and not put constraints on it. Following Figure 2.9 summarise the maturity stages for the Plan Integration dimension.

Plan Integration

Stage	Grimson & Pyke	Other
1	<ul style="list-style-type: none"> - No formal planning - Operations attempts to meet incoming orders 	
2	<ul style="list-style-type: none"> - Sales plan drives operations - Top-down processes - Capacity utilization dynamics ignored 	<ul style="list-style-type: none"> - Wagner et al. (2014): new products, life cycles, capacities, price changes, risk management, and promotions get planned, but not incorporated in the S&OP. - Only a few SKUs/product families are considered.
3	<ul style="list-style-type: none"> - Some plan integration - Sequential process in one direction only - Bottom-up plans, tempered by business goals 	<ul style="list-style-type: none"> - Wagner et al. (2014): new products, life cycles, capacities, price changes, risk management, and promotions get planned, partially and insufficiently incorporated in the S&OP. - Most SKUs/product families considered.
4	<ul style="list-style-type: none"> - Plans highly integrated - Concurrent and collaborative process - Constraints applied in both directions 	<ul style="list-style-type: none"> - Wagner et al. (2014): new products, life cycles, capacities, price changes, risk management, and promotions get planned, and sufficiently incorporated in the internal S&OP process.
5	<ul style="list-style-type: none"> - Seamless integration of plans - Process focuses on profit optimization for whole company 	<ul style="list-style-type: none"> - Wagner et al. (2014): new products, life cycles, capacities, price changes, risk management, and promotions get planned, and completely incorporated in the full S&OP process. - SC-partners integrated in the S&OP alignment process.

Figure 2.9: S&OP Plan Integration Maturity Model

2.6 S&OP Performance Measurement

Performance management regarding S&OP can be divided into three separate perspectives as the definition goes according to Tuomikangas & Kaipia (2007). These are financial performance, operations performance, and process performance. Nakano (2009) suggest

logistics and manufacturing costs, Hahn and Kuhn (2011) mention profit, cost, revenue, Economic Value Added. The operations perspective as according to Nakano (2009) could consist of measurements regarding delivery speed, order fill rate and delivery time. Olhager & Selldin (2007) suggest quality, delivery reliability, delivery speed, product mix flexibility and volume flexibility. Oliva and Watson (2011) add to the Operations perspective with measurements regarding inventory, delivery precision, forecast accuracy, obsolescence rates, and Sodhi & Tang (2011) consider deliver capability as a viable measurement. Process performance measurement was considered by Ivert & Jonsson (2009) and they discuss planning efficiency, decision support and learning effects, which also Grimson & Pyke (2007) treat. Thome et al. (2012) identify both that there is missing a coherent framework for assessing S&OP performance and that there is a need for having measurements that deal with the inherent cross-functional misalignment of interest of the participators of the S&OP. But other literature depict different major trade-offs inherent in S&OP, being customer service vs. inventory (Sodhi & Tang 2011) flexibility vs. SC cost (Affonso et al. 2008) and profit vs. EVA (Chen-Ritzo et al. 2010). Thomé et al. (2012a) though somewhat non-correlating, conclude that S&OP usually only gets measured on integration and alignment or a single outcome perspective only. Collin and Lorenzin (2006) rather purpose that measurements should take consideration for a wider SC-perspective, hence treat factors that also affect SC partners. Specific measurements Collin and Lorenzin (2006) mention are service levels, SC leadtimes, asset efficiency, quality related cost. Practitioners articles often emphasise the use of a Balanced Scorecard as a means to achieve a holistic way of measuring S&OP (Chase, 2013).

Beamon (1999) and many others make a point that measuring SC-performance hardly can be done with single KPIs like cost or service indexes, but rather need to be a construct of various KPIs aligned with the company and SC strategy for both service, cost, profit and so on. S&OP is no different, as it need to be aligned with firm strategy (Grimson & Pyke 2007). As concluded by Thomé et al. (2012) S&OP goals can preferably be sub-categorised as illustrated in following adopted Figure 2.10.

2. Theoretical Framework

Category	Goal
Alignment and Integration	vertical alignment and integration align/balance demand and supply align different firm functions align/integrate plans refines/adjusts/improves functional plans horizontal alignment within the supply chain
Operational improvement	improve forecast improve operational performance reduce/manage inventory and stock-outs manage/balance/align volume and mix manage/balance/align capacity resources manage constraints manage uncertainly and risk allocate critical resources optimise supply capability aid new product introduction measure value creation easure/review business performance
Results based on a single perspective	improve business/supply chain performance improve revenue improve customer service minimise business/supply chain costs minimise demand distortion conduct yield management/pricing
Results based on trade-offs	increase/optimize enterprise profits optimise customer service vs inventory meet demand with reduced inventory meet customer needs with minimum cost
End result	gross profit return on space return on net assets gross profit return on inventory company/product profitability contribution margins

Figure 2.10: S&OP Goals, as adopted by Thomé et al. (2012)

Thomé et al. (2012) conclude that most measurement of S&OP stems in alignment and integration of different functions or SC entities, which generally substantiate in single outcome measurements like business and operations improvement and alignment. Few researchers present it as trade-off goals of different conflicting business strategies, and even fewer as the ultimate goal which is depicted as measuring and optimising for more holistic targets like ROI or profit.

3

Methodology

The following chapter describes the methods used when conducting the thesis and consists of research method, data collection methods, methods for fulfilling respective research question and finally the reliability and validity of the utilised methods.

3.1 Research Method

The workflow or model of analysis of this thesis mainly correlates with an abductive research pattern to answer the research questions, of which an illustration follows in Figure 3.1 below. The difference lies in the outcome, as for this project comprises in a practical recommendation for Volvo to improve their current S&OP process, rather than theoretical suggestions as can be deduced in the illustration of the abduction process adopted by Kovacs and Spens (2005). Step 0 of the process corresponds to fulfilment of research question 1 for collecting data of current theoretical frameworks. Step 1 and 2 then would equal the identification process of discrepancies between the theoretical framework and the current Volvo S&OP process, hence comprising research question 2 and 3 respectively. Step 3 would correspond with the conclusive recommendations of the thesis and answers the fourth research question.

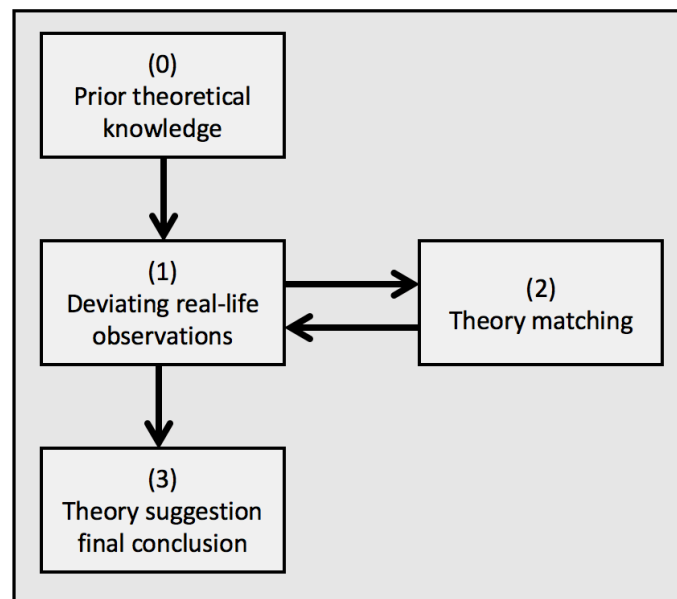


Figure 3.1: Process Chart of Project

The thesis was conducted with a case study on Volvo Group Aftermarket. The topic of the case study is the S&OP process and according to Patel & Davidson (2003) case studies are suitable when studying processes and changes. In a case study it is important to gather information of different types to attain a good understanding of the topic. In the case of the thesis, examples for gathering different types of information can be observations and interviews.

3.2 Data Collection

To facilitate the development of feasible recommendations, the quality of information about current “as is” situation at Volvo becomes crucial, hence both primary and secondary data is gathered. To understand and analyse Volvo’s situation the gathering of data for the theoretical framework becomes equally important. The different methods used for gathering both primary and secondary data are described below.

Recent development of S&OP affecting the method

The S&OP process at Volvo aftermarket has in the past couple of years experienced extensive restructuring, and its current form is developed by a project leader who was on sick leave and unavailable for interviewing when the thesis was conducted. According to Volvo standards the process should be documented in the Volvo Group Management Systems (VGMS) but is currently not. This makes the data collection of this thesis more focused on manual collection of primary data, rather than secondary through process descriptions. The sparse available data about the current S&OP process is stored mainly in PowerPoint templates used for structuring S&OP meetings in the common cloud data service Volvo Teamplace. The meeting templates will be elaborated on further in the empirics about meeting structure.

3.2.1 Primary Data

Primary data consists of data that is gathered specifically for the subject of study and which is to be used in the study (Björklund & Paulsson, 2003). Primary data is important when studying a particular subject in order to gain understanding of it. The different methods used for gathering primary data are observations, interviews, and workshops.

Observations

Observations can occur in different ways according to Björklund and Paulsson (2003). The observant can participate in the observed activity or just observe without participation. The people being observed can be informed beforehand or the observation can take place without anyone knowing about it. Observations can be carried out in many different ways which is why it is difficult to generalize regarding benefits and drawbacks. While observations are time consuming the data gathered from it can give more objective information.

Observations were used in order to understand the S&OP process for the aftermarket which involves several brands. The observations took place at the Volvo LS headquarter where

the meetings which are included in the S&OP process were observed. Further, the behaviour of the participants in the meetings were also observed. The meetings recur on a monthly basis and several similar types of meetings were thus observed to gain a better understanding of the process. The observations taken from these S&OP meetings regarded what is being discussed and how, as well as the behavior and input from different members. This was important in order to get a better view of how S&OP meetings are conducted and what members contribute to the process. Since there are several S&OP meetings occurring every month for different brands, the meetings subject to observation were chosen to in such a way that most of the participants could be located in the local office to ease follow up questions and clarifications. More specifically two Dealer Facing meetings equal to two planning periods for Volvo Penta, and three Parental Warehouse meetings for both VTC and Penta during three periods were observed. Meetings were observed in first person at the occurrence of the meetings. The S&OP meetings for all brands follow the same agenda template, thus selecting a few brands to focus on regarding what meetings to attend should not affect the observations in a negative way.

Interviews

Interviews conducted with employees involved in the S&OP process were of the semi-structured type. In a semi-structured interview, the subject and questions can be prepared but more questions can be added throughout the interview, depending on the interviewees answers (Björklund & Paulsson, 2003). The interviewer needs to be flexible and allow for ideas and thoughts to be developed by the interviewee. Important details which could have been missed have the possibility to arise in a semi-structured interview. Follow up questions could be hard to define before the actual interview and a semi-structured interview allows for this flexibility. One benefit of conducting interviews is that relevant information can be gathered in respect to the aim of the study. There is also an opportunity for gaining deeper comprehension since questions can be adapted to the interviewee and the previous answers expressed by the interviewee.

Data gathered from the interviews was used to understand the S&OP process and interviews were carried out together with people involved in the S&OP process or in some other way linked to it. Individuals whose work is not directly related to the S&OP process but still affects the process with their output were also subject to interview in order gain a better understanding of the S&OP process. The interviewees participating had different positions at the various departments as depicted in Table 3.1.

Interviews were held internally within the Volvo Group with several key persons involved in the S&OP process. All departments that are involved in the process were interviewed, where the individual most involved in S&OP was subject to an interview. Some individuals were interviewed only once and some were interviewed more than once, depending on the need for clarification and how much information they could provide. The complete list of interviews conducted and by how many times can be seen in Table 3.1. During the interviews all individuals were asked to explain how their specific department operates and questions regarding the S&OP process were then asked. These interviews were of high importance for the mapping and understanding of the S&OP process at Volvo, as well as the daily operations of the different departments. The questions around the S&OP

3. Methodology

Name	Department & Position	Interviews
Joakim Andersson	MM TOS - Theoretical Optimization Specialist	4
Johan Andersson	MM Development - Director	1
Thomas Nordenskjöld	MM TOS - Global Manager	3
Johan Hjalmarsson	MM DIM - Manager EMA and Penta	1
Johan Darle	MM MP - Manager	2
Veronica Andersson	MM DIM - Manager	1
Sarah Jansen	MM Refill - Inventory Manager Refill	1
Cilla Zachau	MM DIP - Manager	2
Marcus Bohman	MM DIP - Demand and Inventory Planners	1
Martin Eriksson	GTS/ENS - Director Parts	1

Table 3.1: Interview overview

process were used in all interviews in order to get a full perspective, but since this was a semi-structured interview additional follow-up and clarifying questions were asked when there was a possibility to get more information. Interview questions used for the semi-structured interviews can be found in Appendix 1, A.3.

All of the interviews were recorded with a microphone, averaging one hour of playtime each. This helped both authors to focus on what was being said by the interviewee and to think of possible follow-up questions. All interviewees agreed to be recorded and the recordings were transcribed afterwards. The recordings were kept until the end of the thesis if there would be a need to re-listen to a recording. This helped the authors in finding information easier when needed as well as identifying needs for further clarification of some departments. The transcribing of the recordings were time consuming but provided a solid base for discussion.

Workshops

For establishing what Volvo consider being most important to research, workshops propose an efficient way of gathering information of people’s opinions and reach joint conclusions. The effect of workshops have also been discovered to have more long term effects on the overall mindset of the involved participants (Scott et al. 2013). Hence, trying to include people from Volvo that also participate in the S&OP process would likely induce a more efficient implementation of suggested improvements, both as of extent and in essence of time. Participation in workshops would thus increase the feeling of affiliation with the improvement process. Workshops were then used both for establishing dimensions of S&OP that acquire certain attention, as well as a tool for establishing which discrepancies between “as is” and the theoretical suggestions that can successfully be filled.

Employees from MM involved in the S&OP process were invited to participate in the two conducted workshops. The workshops lead to conclusions about what needed more focus in the thesis project, as well as a way of attaining and confirming empiric data. The workshop also purposed an opportunity for updating Volvo of by then current status of the thesis. Employees from MM were DIM managers, DIP manager, MP manager, S&OP process manager and the thesis company supervisor. As gaps were identified by

the thesis authors, these were presented to participants in the workshop and discussed. The discussion provided with insights on how important different gaps are to the organisation and how well of an improvement these would provide.

3.2.2 Secondary Data

Secondary data as used for this thesis can be defined as any form of written material (Björklund & Paulsson, 2003) which is developed and written with other objectives than being explicitly for used for this certain project. As this is the case it is important to be aware of that this material might be conjured to achieve a chosen viewpoint and could be presented somewhat biased. It is also important to be aware of the origin of data, as databases as well might be incomplete or contain built in biases. A possible advantage with secondary data regarding the literature studies is the availability, because the effort for accessing and retrieving the data might be low.

Literature and theoretical frameworks

To follow the abductive research method, i.e the model of analysis, the project was commenced with creating a theoretical framework. The framework then worked as a preparation that aided the research of current “as is” mapping of Volvo’s S&OP, as it becomes easier to make such observations when having a framework of what to look for and the relevant nomenclature is familiar. The majority of secondary data material used for this thesis hence derives from literature considering S&OP process and maturity. In the beginning of the thesis project the focus was on reading literature to gain understanding of the process, and with time more literature was being taken into subject when it was lacking in the literature study. The theoretical framework was created with the use of articles, course literature, research reports and consultant reports. S&OP within production has gotten more attention than S&OP within aftermarket operations. While the context differs between production and aftermarket, the S&OP process is highly similar and useful in understanding the process of both situations. Most of the research available so far has been conducted for individual companies and conclusions have been reached from those cases, which is why the field is somewhat limited and lacks a more extensive research.

Volvo data

Volvo Group and all different divisions and departments of the group use central online networks to document and share information. The network is called *Violin* and the different divisions and departments store their information in sites called *Teamplices*. Documentation available within these *Teamplices* was gathered to learn more about Volvo and the S&OP process. The documentation included the original project of implementing S&OP with goals, process structure and meeting agenda. Further there was documentation for each meeting that was held stored in PowerPoint format. In addition to this there was Excel sheets including forecasts and regional data which is to be included in S&OP. The data was helpful in gaining understanding of the process at Volvo and how it is conducted. Within Volvo’s network there is also a process map database, called *VGMS*, that maps and in some extent describe the processes within Volvo Group. Although the S&OP process for the Aftermarket is highly relevant to improve on a continuous basis and to help others understand how it works, it is currently not mapped in *VGMS*.

3.3 Model of analysis

A model of analysis is presented to describe the methods used when answering each research question and how the work was performed.

3.3.1 Research question 1

To be able to map how advanced Volvo are in conducting their S&OP process a framework of current industry S&OP practices enable this. The theoretical framework of S&OP practices of this report is developed by researching what parameters that is used in the process, steps in an efficient S&OP process contains, and how mature it is by separating it into measurable dimensions, according to secondary data from literature. The sparse and somewhat dispersed material that is available in the field for different established maturity frameworks for S&OP, implied the use of synthesising to achieve a framework with as complete coverage as possible (Webster & Watson 2002). The most complete framework was then complemented with components from other frameworks and a synthesis for the S&OP process was created.

3.3.2 Research question 2

To be able discover how the process is currently conducted at Volvo LS (As-Is) the use of both primary sources of data through interviews, workshops and observations and secondary in form of Violin and Teamplace data was utilised. The framework created with secondary data from literature was helpful in answering this research question through its structure of the S&OP process and the maturity framework.

3.3.3 Research question 3

To make the discovery of discrepancies and gaps, the data collected about Volvo's process was compared with the synthesised maturity framework and common industry practices. This generate a certain benchmark for how well Volvo currently conduct their S&OP.

3.3.4 Research question 4

Final step of the project consists of establishing what Volvo could do to affect the effectiveness and efficiency of the S&OP process. The need of being able to select which gaps that are discovered in previous stages of the project is apparent. To make a suggestion as viable as possible it needs to be anchored in the organisation as something that can actually be achieved, hence the use of workshops. As established, the workshops also aid in the process to make concluded suggestions for improvement to stick. The involved participants will be more likely to strive for improvement both through being more aligned in the process as well as making it more efficient (Scott et al., 2013). Beyond which of the improvement-suggestions that should be implemented or tested, the workshops will also aid in deciding in which order. Certain actions might need less effort and time and create bigger improvement impact than others and should thus be prioritised.

3.4 Reliability and Validity

Reliability as explained by Bryman and Bell (2015) can be divided into internal and external reliability. External in this matter it is related to how well the research can be transitioned to a new case. Though Bryman and Bell (2015) state that the transition might be tough as the social setting change generally affects the outcome, although if the subsequent research or application is made by the someone with the same social and professional status, the result might become the same. As an example, in a case relating to Volvo the result at another alike company context, with the same master thesis students with alike background would likely generate more similar results and conclusions than if the match is less apparent.

Internal Reliability refers, as concluded by Bryman and Bell (2015), to the matter of how well the researchers agree internally about conclusions. The level of internal reliability of this report would hence deteriorate if the authors of this thesis would be misaligned in opinions of how the project should be conducted. The internal reliability is hence with hindsight, very high, when asking the authors.

The matter of internal validity is defined as the degree of how well the developed theory match the made observations according to Brymann and Bell (2015). The internal validity hence correlates to the quality of how well the qualitative research is made, i.e in this case how well the inductive research for primary data is retrieved through observations, interviews, workshops and surveys and deductively the secondary data in form of literature review and Volvo data in this case. By trying to incorporate all the available resources for data retrieving through including people that are involved in the S&OP process, but also those who might be having interest in the outcome or would benefit from partaking information that is generated in the process, the level of validity gets higher. Naturally everyone's opinion cannot be a part of the data-set, so the selection of interviewees etc. is made with consideration to developed best practice theoretical framework and by recommendations of other S&OP process participants.

External validity refers to the width of the contextual fit of the findings, i.e the generalisability. In this case where the final findings aim to be custom fitted to provide with Volvo a solution best suited for their setting, thus the degree of external validity of course gets inferior to the internal. Some of the recommendations might though be valid for use in settings alike the one researched Volvo's Aftermarket with big assortments and various brands that are difficult to coordinate.

4

Empirical Data

This chapter is the results of primary and secondary data collections regarding the S&OP process and information related to it. The chapter covers the current "as is" situation at Volvo including the Aftermarket context, their product offer, organisation, forecasting and planning parameters. Subsequently more specifics about the S&OP process are presented, including ICT structure, S&OP meetings and the use of KPIs and PIs. Lastly, the empirical data is related to the maturity framework from chapter 2.

4.1 Volvo S&OP Context

In addition to the researched S&OP process at Volvo aftermarket there are various other factors that affect the outcome of S&OP which get presented in this section. The content includes the aftermarket context, both internal and external that should present the context of Volvo Aftermarket.

The Figure 4.1 below illustratively depicts the supply chain for Volvo's aftermarket. The supply chain is mainly based on MTS principle and products are stored in three stages of warehouses. Products are sold to end customers through dealers and these dealers' inventories generally get refilled based on pre-determined lot sizes and stock level algorithms. The same goes for stocks in Regional and Support Warehouses (RWs resp. SWs) which get refilled from Central Warehouses (CWs). CWs are then supplied by Volvos suppliers. As can be discovered in the bottom part of Figure 4.1 the different stages are more or less handled by the different departments of DIP, Refill and DIM respectively, which roles will be further explained in forthcoming chapters. The Volvo Group can as of today be considered as a globalised company, which can be identified in the map over Volvo's warehouse coverage below in Figure 4.2. Volvo separate the market into regions to easier handle the organisation, time zone differences and customers.

4. Empirical Data

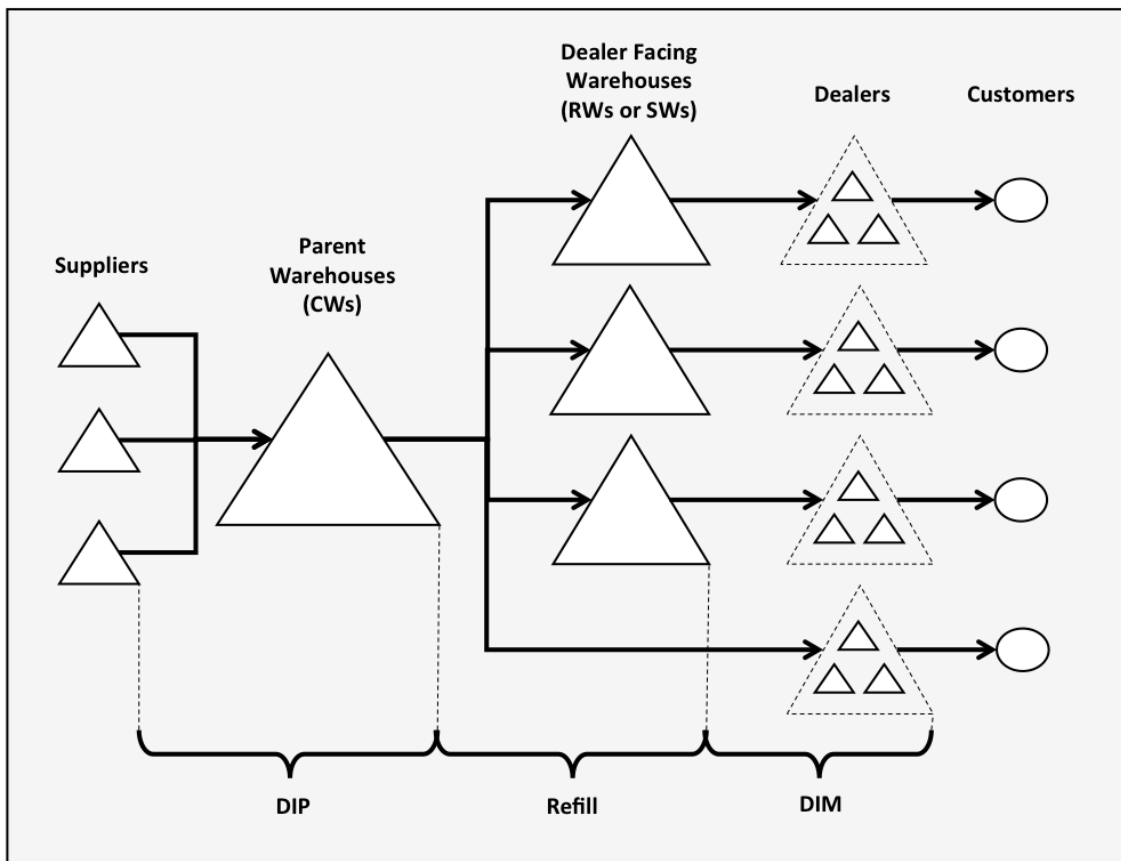


Figure 4.1: Volvo aftermarket supply chain



Figure 4.2: Global warehouse coverage, as adopted by Volvo Group (2015)

4.1.1 Internal Context

This section provides an overview of the internal context, in form of the product offer, organisation and overall strategy at Volvo aftermarket.

4.1.1.1 Products and Differentiation

The product offer at Volvo Aftermarket aims to mimic what demand the sales of trucks, buses and construction equipment in the brand portfolio induces in form of service articles, and to some extent also customisation of new products, for example, if a customer wishes to have a certain set of rims or another type of gear stick these can be retrofitted and hence supplied by Volvo aftermarket.

Volvo Aftermarket currently manage a product portfolio containing approximately 600 000 different articles, which is continuously growing as new products are released. The parts also have different SKUs depending on which CW they are designated to. There are some articles that are compatible with several brands, for example some filters fitting both Volvo's trucks and Renault's, but still the vast majority of articles are brand specific. The different brands in Volvo Group sell more or less in different regions as well, so there is also need for differentiating the inventory on a regional basis. The aftermarket division of Volvo does have the advantage of being a rather high-margin business, which in some extent compensate for the complexity and cost for high inventory levels. Though the margin does not decrease the importance of trying to optimise inventory levels, and one of the main targets for the Volvo Group's aftermarket is to maintain certain service levels for certain products. The service levels are thus affected by the differentiation of products into various groups or classes. The first differentiation substantiate in separation into "vital classes", which in some extent varies depending on brand, as all have different development departments that historically have set their own classes. As a rule, the Truck-brands, VCE, and Volvo Penta have their own vital classing system respectively, though they are very similar. Common characteristics is that parts are subdivided into four of these classes. The differentiation is also based upon what part of the product life cycle the article is active in, i.e. phase-in, prime, decline or phase-out, in that chronology. The differentiation also considers price of the product and how many order-lines it generates.

4.1.1.2 Organisation

Volvo was founded in 1927, with the idea of creating safe vehicles with high quality. From building their first passenger car in Gothenburg, Volvo has since grown into a group which produces different types of vehicles and components. In 1999 Volvo Cars was sold and a series of acquisitions took place where companies that produce trucks and construction equipment were mainly acquired. Today the Volvo Group employs approximately 100 000 individuals, with production facilities in 19 countries and sales of products in more than 190 markets. It is one of the leading manufacturers of trucks, buses, construction equipment and marine and industrial engines. The group is organized into Group Trucks and five other Business Areas which consist of Construction Equipment, Buses, Volvo Penta, Governmental Sales and Volvo Financial Services. The Group Trucks includes the combined operations for the Group's trucks. These operations include product

4. Empirical Data

development, manufacturing, purchasing, sales and aftermarket. The Group Trucks has several truck brands. These are Volvo, UD Trucks, Renault Trucks, Mack Trucks, Eicher and Dongfeng Trucks. The Volvo Group further holds three brands within Construction Equipment which are Volvo, Terex Trucks and SDLG. Within Buses the five brands are Volvo, UD Bus, Sunwin Bus, Prevost and Nova Bus. Volvo Penta acts as the only brand Volvo Group holds in the marine and industrial engines industry.

Volvo Group is as described divided into different business areas. The thesis is conducted at the Materials Management department, which is located in Logistics Services under Group Truck Operations. Group Trucks Technology mainly deal with development of the product range. Group Trucks Sales which is undergoing a transformation to brand specific departments, deal with the demand side, and Group Trucks Purchasing handle supply side and purchasing. The structure is illustrated in Figure 4.3.

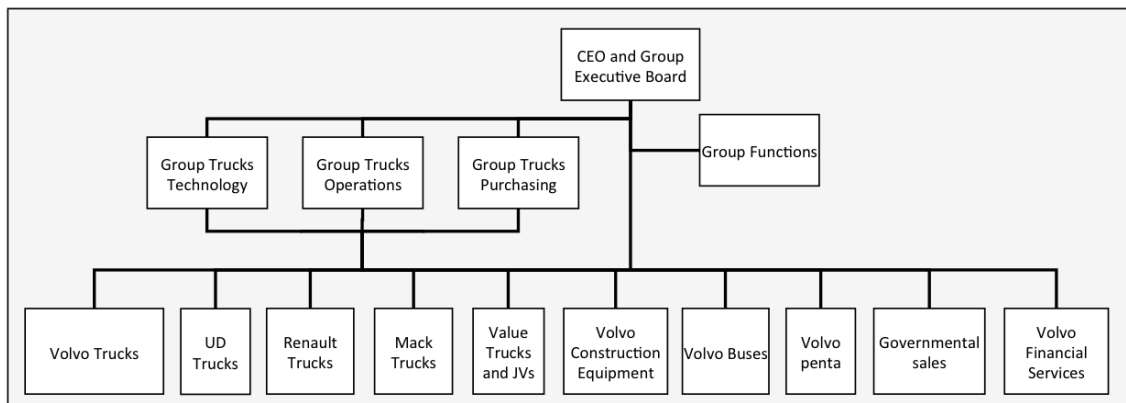


Figure 4.3: Organisational chart, Volvo Group

As can be identified in figure 4.4, Logistics Services (LS) is a part of the Volvo Group, directly linked to Group Truck Operations. LS employs approximately 4 900 individuals in 50 locations worldwide. LS serves all the brands within the Volvo Group where it seeks to reduce costs, avoid disruption and minimize environmental impact. LS manages the global manufacturing logistics, global aftermarket supply chain, packaging, customs compliance and trade governance. Within the aftermarket supply chain the tasks of LS are to supply materials to spare part warehouses, optimize global inventory of spare parts, handle orders and deliver spare parts to dealers. The activities included in the aftermarket supply chain are required activities to secure uptime for the end customers' products. LS plan the parts throughout their total life cycle, optimize transports in their network for both inbound and outbound shipments, handle customer orders and manage warehouse operations.

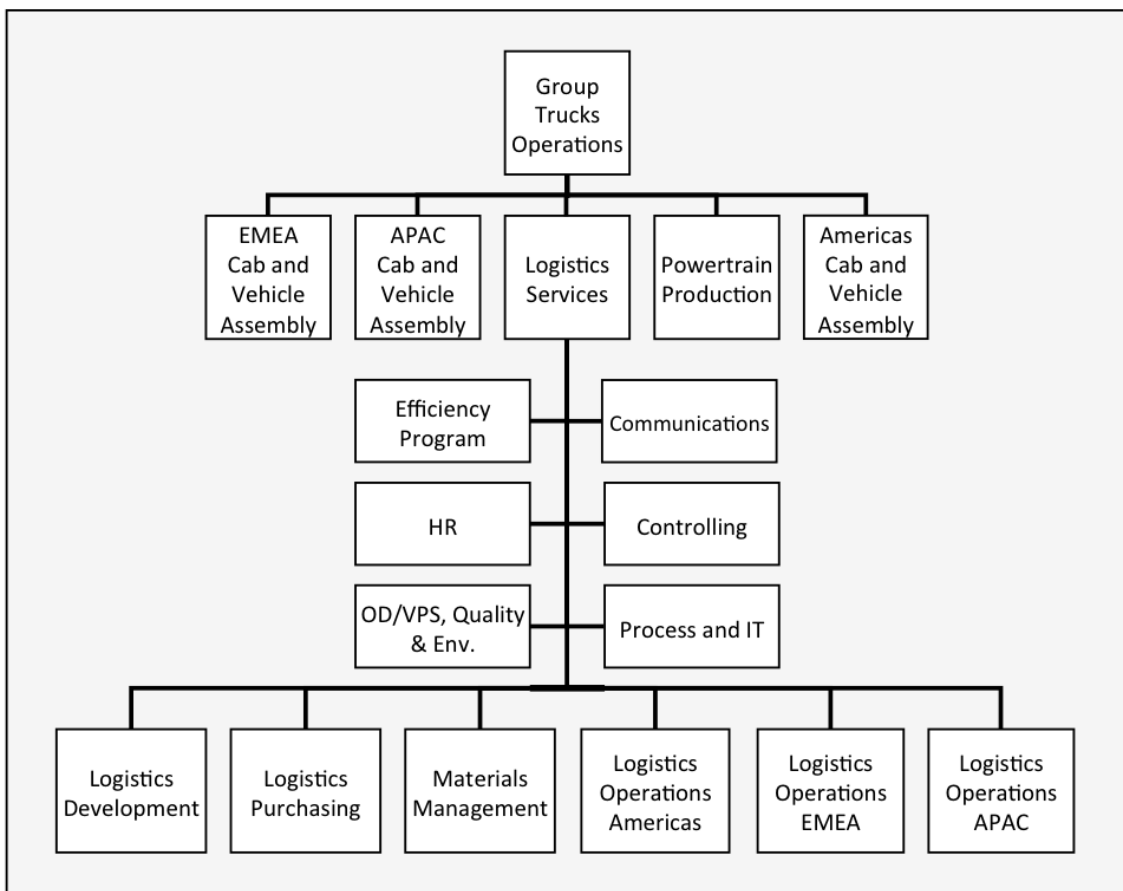


Figure 4.4: Organisational chart, Group Truck Operations and Logistic Services

Materials Management (MM) is a unit within LS, where other units are Logistics Purchasing, Logistics Development and Logistics Operations for different regions. The different units own their processes and are organized in Global Functions, Global Operations and Regional Operations. MM is organized in Global Operations where it owns the process of planning the material. Within MM there are different units which support the planning of materials. These are Dealer Inventory Management(DIM), Materials Management Development, Demand Inventory Planning (DIP) and Materials Management for different regions.

The organisation at MM is during the writing of this thesis initiating a re-organisation, as the departments of DIP and Refill are to be merged. The new organisational chart for MM can be seen in Figure 4.5 and the new roles responsibilities in Figure 4.6.

4. Empirical Data

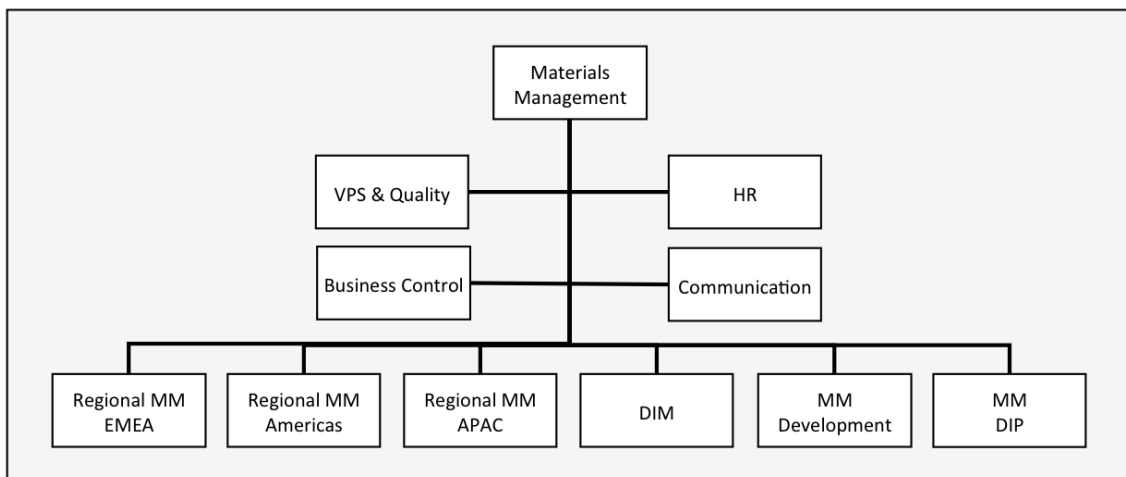


Figure 4.5: Organisational chart, Material Management

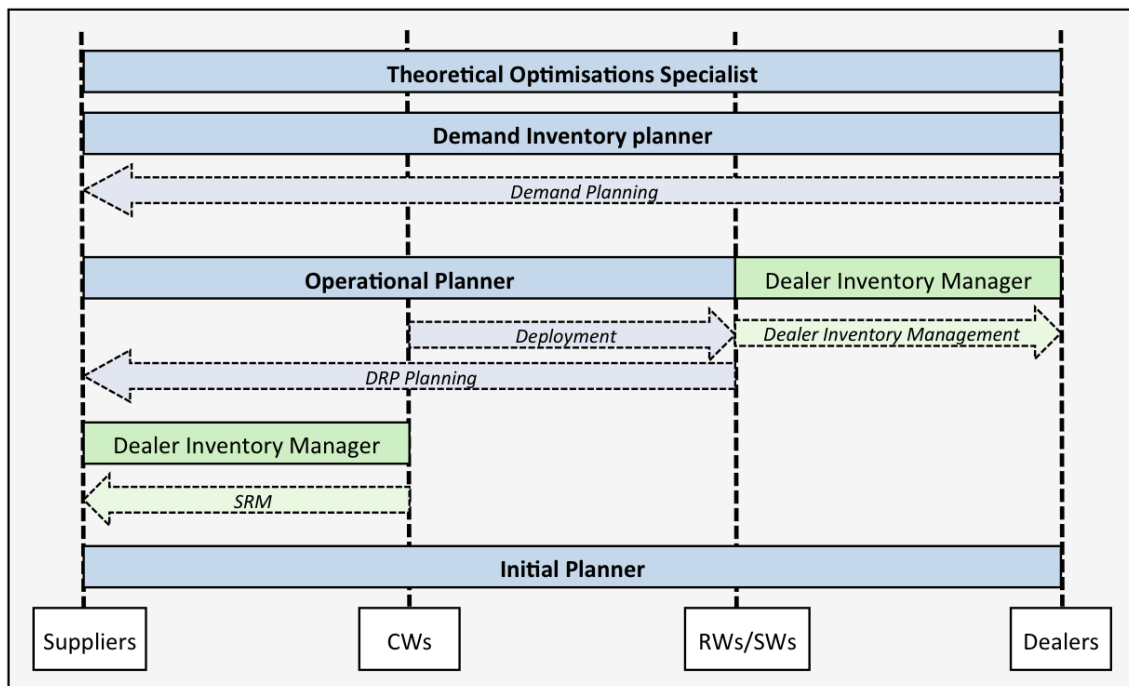


Figure 4.6: Responsibility chart for the new to-be organisation at MM

As the As-Is analysis will be treating both how the situation is now and what likely will happen when the re-organisation is executed fully, and the recommendations will be customised to fit the future, the previous structure is also illustrated below in Figure 4.7. Following the different roles within the department will be elaborated on.

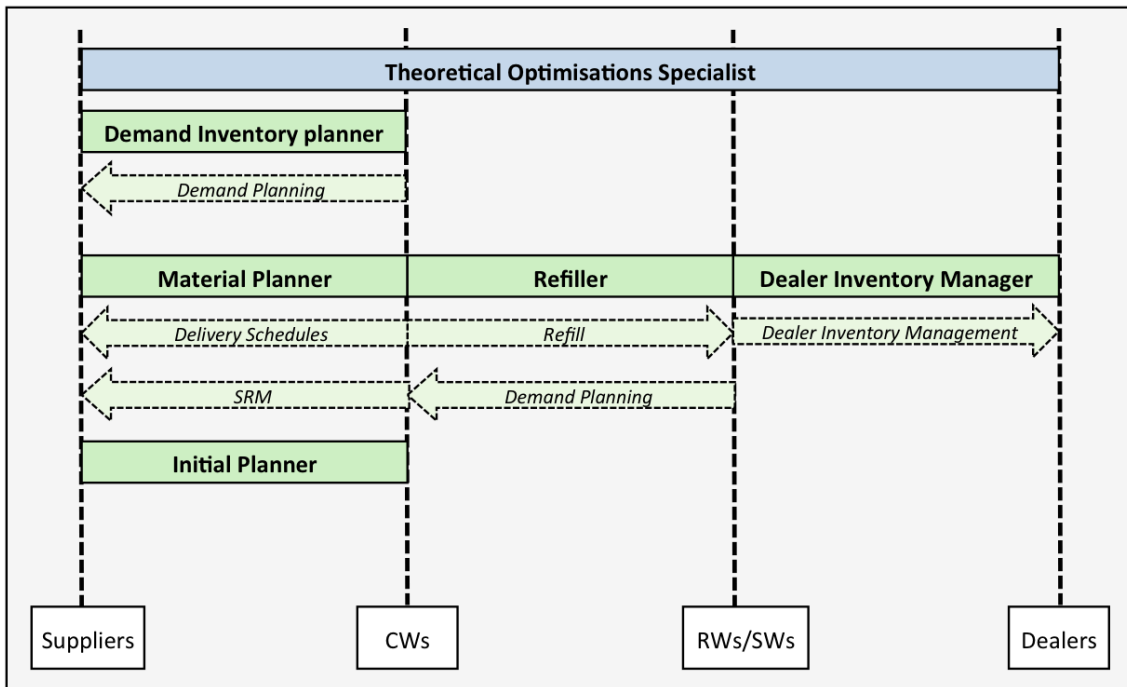


Figure 4.7: Previous responsibility chart for the organisation at MM

Theoretical Optimisations Specialist

This department works with optimising the methods used for forecasting, stocking and lot sizing methods, by constructing and using simulation software and current best-practice.

Demand Inventory Planning (DIP) and Refill

The DIP department are to have a global responsibility to maintain forecast accuracy and to assign the right forecasting methods to products and product segments. They also have responsibility for maintaining demand history and segmentation. The forecasts made by DIP create the initial delivery plan to suppliers and indirectly control the inventory level at the CW.

As of today, the Refill department are responsible for maintaining the stocks at the RWs and SWs. They work with and adjust the levels in the warehouses and what is to be shipped from CWs to these. This role is in near future to be integrated into the DIP-department to compensate for silo effects, departmentalisation and bullwhip effects in the internal supply chain.

Operational Planner

This role is a part of the new organisational structure at MM, and will include global responsibilities regarding the upper half of the supply chain, i.e the stocks of CWs and RWs and the integration between these.

Dealer Inventory Management (DIM)

The DIM department handle the interface with the customers, or in this case the dealers. They are responsible for maintaining the stocks at the dealers according to the system and in some extent their preference of stock level. They also handle the return flow from deal-

ers, if the wrong parts were delivered or if the parts did not sell out.

Initial Planner

The Initial Planner is also one of the new to-be roles. They are to integrate the phase-in process of new product introductions and handle the initial stocking. The role will likely generate more accurate forecasts for new products and better integration of new suppliers.

Material Planner / Supply Planner

The Material Planners that have this role handle the interface with the suppliers, and carry out the system output and work together with suppliers to ensure precision of deliveries in quantity and time between suppliers and CW. They work with the delivery plan and create call-offs to ensure incoming material.

4.1.1.3 Overall Strategy at Volvo Aftermarket

Current focus for LS specifically is to achieve higher service levels and stability, through striving for higher service indexes, back-order recovery and delivery precision whilst still maintaining cost management. The strategy of LS is represented in what is called "The Window", where the overall strategic targets are represented in a matrix containing dimensions of customers, deliveries and people. The targets are also subdivided into three different stages of strategic horizon in a road map.

4.1.2 External Context

The context of a company acting in the aftermarket makes the demand profile somewhat special, as the majority of products are made to stock only. This becomes the case because the urgency of need for spare parts are higher, as the customer demand many times comes from sudden situations, either from trucks breaking down or needing service. The component of the demand that is order initiated could instead derive from very expensive products that are difficult to keep in stock over a long period of time. These products are manufactured when an order comes in. As the majority of the demand being made to stock, it makes the use of extensive forecasting necessary, and also the SC becomes rather inventory dense. The complexity of the supply chain and dealers dispersed all over the world, with several brands all with different products and low utilisation of parts-sharing synergies, does not make the task easier.

The competition on the aftermarket for Volvo Groups product varies somewhat depending on product complexity, which hence also affects what pricing strategy Volvo conjures. For a product with high production complexity, Volvo generally becomes the one and only supplier with pricing and availability being controlled and adjusted accordingly. Products with less manufacturing complexity are not surprisingly easier to mimic for other manufacturers and hence the competition situation forces Volvo to use other pricing strategies and service levels to stay competitive.

4.1.2.1 Upstream

For each spare part article there is at least one supplier assigned. One supplier can also supply several articles, but in general at Volvo the supply strategy is single sourcing. This opens up for potential disruptions in the supply chain which might affect the service level to dealers. The department at Volvo which deals with suppliers on an operational level is Material Planning, while there is a purchasing department when new contracts are to be signed. Material Planning places orders to the suppliers based on the required amount of spare parts needed, although within some restrictions on order quantity and lead time.

Apart from the suppliers of spare parts there is also transportation to be accounted for. Volvo uses suppliers to transport from their spare parts suppliers to their central warehouse and also in between their different warehouses as well as to dealers.

4.1.2.2 Downstream

As explained, the internal distribution network of Volvo Aftermarket comprises of three levels of inventory keeping, at Dealers that maintain the interface with customers, Regional Warehouses (RW) and Support Warehouses (SW), and finally Central Warehouses (CW), as can be depicted in the Figure 4.1 above. The end-user interface is hence handled by the Dealers, of which about 50% are directly owned by Volvo Group and rest independently managed. The inventory at dealers is managed by Volvo, i.e Vendor Managed Inventory (VMI) as for the most part, but dealers are though to some extent able to adjust the inventory levels manually. Inventory is owned by the dealers, pushed by Volvo, but with a special clause that Volvo have to buy back whatever stock that has not been sold during the last 6 months if the dealer sees fit.

The supply chain allows for use of different ways of transportation of products through sea, road and air which is handled by 3PLs. The different means of transport offer different advantages, and Volvo use them differently for different products and orders. If necessary, for recovering back-orders Volvo use airfreight to maintain high service levels, which might render more but motivated cost. Airfreight is also used as standard for some products because TCO-calculations have showed that this is more cost efficient due to capital costs related to inventory keeping. The different types of orders that Volvo uses is related to how urgent the delivery is. Stockorders are the most common type of order, which generally utilise the slowest and cheapest way of transportation, and these are well planned ahead. Dayorders, on the other hand, are generally allowed to utilise transportation means like airfreight to arrive at destination as fast as possible, and many Backorders become Dayorders. Lastly Vehicle Off Road (VOR) orders represent the most urgent category, these are so important to handle fast that the product in some cases could be retrieved directly from the line at the truck production facility and then shipped by air to its destination.

4.2 S&OP - Volvo Definition and Goals

As depicted in Volvo's meeting template for their Flow Planning meetings the process purpose is to monitor sales, forecasts and stock values for the different warehouses. As previously explained, the term Flow Planning is corresponding to S&OP as asserted by Volvo, and is just a remainder of old nomenclature. The data input for the process is to be used for making decisions to optimise stock and availability. The process also seeks to facilitate the sharing of important information between the involved stakeholders, as for an example people that represent the warehouse inbound and outbound processes partake in Flow Planning meetings to get information that can help them in deciding capacity in form of available man hours. The process is organised around the principle that functions involved in the flow are represented in a team-structure, to enable understanding of the flow and other departments targets, to identify any apparent risks or bottlenecks in the flow, and to generate activity plans with people responsible for the planned actions in order to mitigate risks or to improve the process if possible.

The aim of the S&OP process at Volvo Aftermarket is to *"achieve a proactive planning on a medium length horizon, whilst detecting current and future bottlenecks to be able to react with adjustments in time, and to achieve the right service levels through an effective and efficient supply chain"*.

4.3 Planning Parameters

The planning parameters as defined by Volvo are described below. These are relevant as context descriptors, specifically for the planning environment in S&OP.

4.3.1 Planning Horizon

In the S&OP process the planning mostly consider the tactical perspective of 3-6 months ahead, which is also included in the scope of Volvo's Flow Planning. This planning horizon is the proposed one for the S&OP process, although the actual planning horizon during the meetings turn out to be 0-3 months as well as discussing events that have come up during the past month that need attention. The system for planning though create delivery plans stretching to 12 months that are shared with suppliers. These certain delivery plans are further described below in the S&OP process description.

4.3.2 Planning Frequency

Within the S&OP process, meetings occur on a monthly basis with different people involved depending on what type of meeting is being held. For each brand and market the Dealer Facing and Parental Warehouse meeting is held once a month. Further the decision meetings are being held short after the Parental Warehouse meeting, which occurs as a consequence of the Dealer Facing and Parental Warehouse meetings. The meeting structure and what gets treated in each meeting is described in following sections.

4.3.3 Planning Objects

The number of products in the aftermarket supply chain of Volvo are estimated at approximately 600 000 Part Numbers. The total Part Numbers change continuously since parts are being phased in or phased out. Due to this complexity the products are grouped and segmented. Due to system design, the different business areas of Volvo Construction Equipment, Trucks, Penta and Buses each have four different specific classification definitions, which though are based on about the same principles and named similarly. As for the comprehension of the classes in daily operations and S&OP meetings, the complexity is not considered a problem based upon interviewee answers.

Forecasts are made for each product in the IT system which is later aggregated to product groups and segments. During the Flow Planning meetings, the planning objects are presented through a forecast based on total unit volume, i.e. the total number of parts to be sold. The Planning Object from the sales side is handed over in total monetary volume, which needs translation to total unit volume.

4.3.4 Units of Capacity

In Volvo's S&OP process there are no expressed units of capacity which are to be measured against the forecasted demand. However, while they are not measured the capacity relates to warehouse volume, warehouse personnel, transportation capacity and suppliers' production capacity. Most of the capacity restrictions will not hinder Volvo from increasing forecast since more warehouse space can be rented, more personnel can be hired and more transportation can be bought. If these events happen over a longer period purchasing will get involved and secure more capacity, although hiring more personnel is problematic in the short term. The capacity that can restrict material from coming in is the suppliers' production capacity. These capacity restrictions are only seen on article level and will move any orders exceeding the restriction to the next possible period. These restrictions are put in place by the previous set delivery plans and forecasts, and they are difficult to increase or decrease within the lead time agreed with each supplier. The capacity restriction of suppliers is the most important for Volvo to secure material availability and should be considered in some way within the S&OP process.

4.3.5 Time Fences for Changes in Plan

Time fences used are the minimum lead time and some additional time which creates a total freeze time. This freeze time is not expressed on an aggregated level but is instead stated for each article number. The time fences used are thus different for each article based on what has been agreed between Volvo and the supplier of the specific article. Further there are also limits in how much quantity can change manually within a certain time frame, both increasing and decreasing the quantity. During the freeze time there should not be possible to change the order quantity.

4.4 Volvo S&OP Process

Following section delves into how the current S&OP is conducted at Volvo aftermarket, how has the process developed, and more about the enabling technology they use, how meetings are executed and what kind of measuring Volvo use.

4.4.1 Forecasting and the Supply Chain

The inventory levels are optimised for reaching the desired service level, a process that is executed on a monthly basis. Depending on the type of warehouse different service levels are used, with the highest service level being located at the central level. The forecasting method is also differentiated depending on what class the products have. As an example the sales pattern of many products from Volvo Penta are very dependent on which season of the year it is, due to the fact that the end users in the marine segment are most active during spring, summer and fall season, hence the use of forecasting methods that consider the seasonality index gets more common. Other forecasting methods utilised depend on moving averages and use of exponential smoothing.

4.4.2 S&OP Process Structure

The process structure categorisation as follows describe Volvo's S&OP in the terms of presented theoretical framework to enable the further analysis in the same terminology.

4.4.2.1 1. Product Management Review

The product offer at Volvo is of course highly dynamic, thus continuously new products are released and old products become obsolete. The new product introduction gets initiated by Spare Parts Engineering who deals with the Phase-In. These are generally handled as projects, during which decisions about whether a product is necessary to keep in stock from day one and then in what volumes. The process of deciding what needs to be part of initial stock is relatively difficult, as he/she who decides needs to have a lot of knowledge both of the sales dynamics characteristics for earlier similar products have had as well as the occurrence risk of breakdowns for service articles. Hence he/she has to be experienced to be accurate. When a Phase-In project is finished for a product the forecasting systems continue the control of inventory. The responsibility for the phase-in of products included in this process step is to be managed by the new role of Initial Planner at MM.

4.4.2.2 2. Demand Plan

Volvo create plans for both the dealers and the warehouses. The plan for the dealers is a sales demand plan while the plans for the different warehouses are made upon demand from next adjacent entity in the supply chain. The plans for the warehouses are forecasted to be able to order the correct amount of goods. The forecasting and inventory keeping is managed step by step. Each actor in Volvo's aftermarket supply chain has its own demand to their specific regional markets. The inventory levels at the dealer is managed by order-point systems based on previous sales as well as the targeted service level. The inventory levels at RWs and SWs are based upon deliveries made to dealers, and finally inventory

at CWs are based upon forecasts and deliveries made to RWs and dealers. There are different target service levels for all types of warehouses, with the CW having the highest target service level. There is EPOS data which is being underutilised at a central level and market specific campaigns are not being incorporated in the forecasts for the warehouses. This can cause disruptions in form of back-orders and overstocking.

The demand plan is partially influenced by a sales forecast delivered from the GTS division. This GTS sales forecast is based on monetary values which is affected by currency and price levels in different markets, as well as other factors. The MM forecasts created for the aftermarket supply chain are expressed in terms of units of SKUs. Thus it becomes hard to translate the GTS sales forecast and incorporate it into the MM forecasts, because changes in price and currency might still represent the equal number of SKUs as before. This is prospected to undergo a transformation to forecasted sales volumes instead, which would be more useful in the planning process at LS. Further there is an input from sales towards dealers which should explain past events and also future events which might occur. This demand data is to be presented at the Dealer Facing meetings. At these meetings a representative from CW Gent is present to inform about current capacity and get information to plan for future capacity. The planning horizon for the representative from Gent can vary a lot, as well as the attendance at S&OP meetings, and it is not presented for how far ahead they plan their capacity, while the current status just shows what has recently happened.

4.4.2.3 3. Supply Plan

Based on forecasts a supply-plan, i.e. rather a purchasing plan as Volvo have no in-house production, is generated from the system which is to inform suppliers about future needs and act as a guide for the material planners. The suppliers are handed a 12 months rolling supply-plan on a weekly basis. This supply-plan is concerning the flow between suppliers and the CW Gent. Further, the deliveries between warehouses are handled by the system, and when stock levels of a certain part number reach set reorder-point, for example, the product gets pulled from above adjacent warehouse. Flows also get generated by manual orders created in the different instances by Dealers, Dealer Inventory Managers, Refillers or Demand & Inventory Planners.

The Material Planning department is responsible for the flow of products into the Volvo supply chain, and manage the contact with the suppliers. They are to follow the established supply plan created by the system and DIP department. Though there are restrictions regarding how much can be ordered from suppliers, either by capacity issues or time fences when orders cannot be changed.

4.4.2.4 4. Rapprochement

As described in the following chapter about meeting structure, the finalising of the plans is mainly occurring during a certain decision meeting. During these meetings aspects regarding forecast adjustments or capacity adjustments get treated. This meeting is then followed by sign-off meetings that climb upwards in the organisational structure. Generally nothing gets changed in the forecasts and plans during these sign-off meetings but

remain as set by the decision meeting, with exception of for example non-compliance with higher order corporate strategies.

4.4.2.5 5. Measure, Communicate and Implement the Plan

When the plan with adjustments is established and signed off, it gets executed and implemented in the system. The plan hence drives the operational business as for what volumes should be sent where, what volumes need acquiring by purchasing and what capacity in man hours and so on is necessary to execute it. As for the measurement of planning, it is conjured through use of various KPIs assigned to different owners at different departments or management at Volvo Group. There are no KPIs, nor certain measurements assigned to the S&OP process explicitly.

The plan is in a manner only distributed asymmetrically, i.e. operations or purchasing aspire on executing what sales will likely sell, and sales will generally not adjust their performance according to conclusions from S&OP. A PI which is used to measure how well plans are made is forecast quality (FCQ). This is measured against the last set forecast against the previous periods actual sales and is treating the CW forecast generated by DIP and not for GTS forecasts which is one of the inputs for the S&OP process.

4.5 S&OP Dimensions at Volvo

The following section describes Volvo's S&OP process, with the perspective of the S&OP dimensions as presented in the synthesised maturity framework.

4.5.1 Meetings and Collaboration

One of the cornerstones of the current S&OP at Volvo Aftermarket is their continuous meeting process. These meetings propose one of few moments that the different departments of DIP, Refill, DIM and Material Planners meet and discuss matters that are cross-functionally relevant, at least on a regular and standardised basis. There is though still some confusion about what information that is necessary to transfer between the departments, how it should be done, how often and on what aggregation level. Due to these confusions and difficulties of aligning stocks and sharing information, a re-organisation and integration of the departments of DIP and Refill is already planned. Figure 4.8 below describe the chronology of the meetings that occur in S&OP at Volvo Aftermarket.

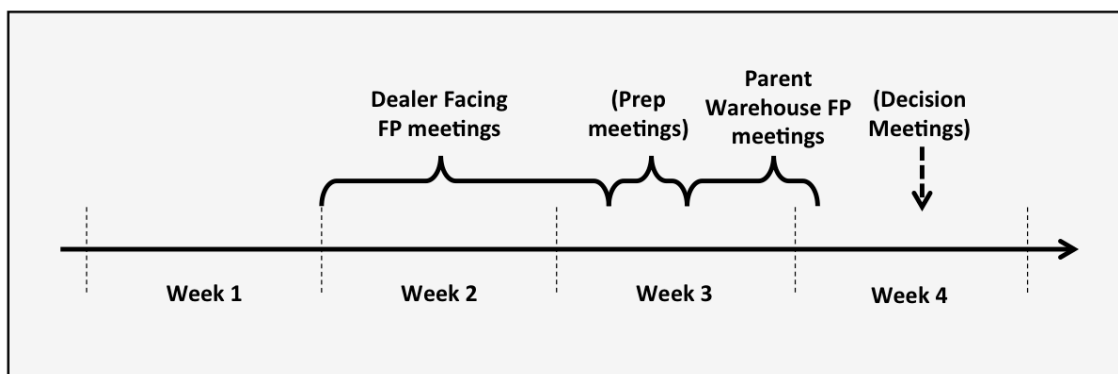


Figure 4.8: S&OP meeting process

4.5.1.1 Dealer Facing Flow Planning Meetings

The dealer network of Volvo Aftermarket is so large and dispersed over the world, that they are organised in regions and clusters to enable more convenient management. For VTC only there are then around 17 clusters of dealers and 58 in total for all brands. The S&OP process at Volvo Aftermarket could be considered to begin here, with meetings in these interfaces on a monthly basis which are called Dealer Facing Flow Planning meetings (DF FP). At these meetings information about any sudden situations that have appeared is lifted. The attendees list comprises of responsible DIM-manager, connected RW or SW manager for inbound and outbound, and a representative from GTS that explains forecasted demand and sometimes a representative from DIP as well.

4.5.1.2 Parent Warehouse Flow Planning Meetings

The next level of aggregation of meetings of the S&OP process is the Parent Warehouse Flow Planning (PW FP) meetings, where information that could be cross-functionally useful and gathered from DF FP meetings is presented. These meetings will hence gather people from different functions of the internal SC to lift subjects that could affect people from departments not usually involved in each other's processes. The attendees come from all the departments involved in the business to control flows between the SC tiers of RW, SW or CW directly to dealers, i.e DIP, DIM, Refill and Material Planning departments.

All PW FP meetings are to be executed according to a pre-set agenda that is in the form of a PowerPoint template. This ensures that the meeting is time-effective and that any standard issues are not missed. The meeting generally follows the attendees list, and respective department get to present their forecasts and KPIs while others are able to give input and ask questions in case something is unclear or could affect their department. The presenters are also supposed to lift issues that might affect the other parties. If participants agree upon any new actions these are noted in the PowerPoint slides and is assigned a responsible owner of the action who are to execute it. The action list is reviewed and updated for each meeting, to see current progress or if some other action is appropriate. The main take-away from the meeting according to the attendees is the cross-functional information exchange, and therefore the main focus should be to provide with information

that in any way could affect and improve other departments operations.

If examining the meeting template, it is designed to facilitate both the S&OP meetings as well as acting as way of collecting the process' data. The different updated PowerPoint slides get summarised and aggregated at MM for all the different regions and brands and is used as material for decision-making of delivery capacity and warehousing. The first page of the meeting template for PW FP describes the purpose, scope, frequency, principles and of the meeting. The purpose is expressed as: "To analyse and suggest decisions needed to be taken in decision meeting to plan the overall material flow of spare parts in order to achieve the right customer service with the right mix of inventory/cost. This by monitoring sales, forecast and stock value for the central warehouse due to changes in demand pattern and suggest changes and decisions to optimize stock and availability. Spread information between inventory planning and warehouse regarding changes in the processes". The scope as suggested by the template is 3-6 months and should cover the SC between dealer and supplier, and the frequency should be monthly for all flows. 3-6 months in this case is considered more of a target than common practice, and the interviewees attending the meetings conclude that the focus rather lies in the vicinity of 0 to 3 months and a lot of focus on previous periods, i.e. one month back in time for example. The stated principles from the template:

1. To plan in a team where all major functions in the flow are represented with a total supply chain visibility
2. To understand the flow (KPIs, Demand Flow, Supply Flow)
3. To make an analysis and identify risks/bottlenecks
4. To make and implement an activity plan

The template then explains the SC-schematics and what which meeting should cover, and also the chronological process steps of the whole Flow Planning meeting structure (Figure 4.8). To check that all functions as specified are represented a list of attendees for all the roles with correlating responsibilities in FP and the desired position in the company is checked. Then the meeting agenda is presented and subsequently the minutes from previous meeting and decisions made at the final Decision meeting, which will be further explained below.

4.5.1.3 Decision Meetings

For the S&OP process at VTC and Penta which is managed from Volvo Arendal, next stage of the process is a Decision meeting. This meeting is not described in the process description material available through Teamplace, but is rather a construct that stems from a situation that appeared when PW FP attendees did not have the necessary authority to execute certain decisions. At these meetings, decisions about forecast adjustments and capacity increases or decreases for logistics are taken. For example, increasing forecasts for engine filters due to a new "to become" EU regulation, or if there would be the need to increase the container capacity for a certain interface or transport distance induced by increase in sales. Decisions from these meetings need confirmation from higher authority as well, but is almost without exception granted automatically. The efficiency of these meetings is unknown, which is the result of not measuring the decisions taken. That is,

if a decision about a judgemental increase of a forecast is taken, the outcome is not compared to the scenario that would have been if the quantitatively calculated forecast from the system was used.

After the PW FP meeting there are several sign off meetings taking place. There are two sign off meetings with MM directors, i.e. above decision meeting, followed by a sign off meeting with the MM CEO. This is followed by three sign off meetings with purchasing and three sign off meetings with regional LS VPs. The final step is to sign LS in to the overall GTO S&OP.

4.5.2 Organisation

The process of S&OP, i.e. Flow Planning, is organised under LS and more specifically under MM. The MM organisation is involved with the steering of materials in their network from supplier to dealer and are directly affecting and affected by Flow Planning. The different roles represented in the Flow Planning meetings are DIP, DIM, Refill, MP, DCs, GTS and dealer sales representative. There is no formal process owner or a formal S&OP Manager role working full time with S&OP, but there is a role whose responsibility is to lead the process and coordinate with others about the outcome. There are further no full-time roles within S&OP and all roles included in the process make up a S&OP network, but this network makes up the formal S&OP team. The network constitutes of the different roles represented in Flow Planning with a large focus on roles within MM. Although GTS is represented in the DF meetings their total contribution, involvement and output from the process is questionable.

The role of finance is non-existent in the meetings and along the process and their subjective opinion of the different roles is that their contribution is not needed. However, in the decision meetings there is a business controller present from LS when inventory adjustments are being made. Further roles which are missing, are those which hold knowledge about the products in question and can answer to how they will behave. For example, while roles within MM will guess how often a certain product will have to be replaced there are people within the Volvo Group who know how a certain product might behave in the market based on probability of breakdown. GTS is also a part of Volvo which can provide with more information on specific markets and how they are developing. Since forecasting influences the inventory levels, more information of the markets that are being forecasted would help Volvo in avoiding disruptions and being more proactive. The sales organisation and the organisation at LS do not communicate further than the Dealer Facing meetings today and the collaboration between the two is quite low. While sales might have market data this is not shared with LS.

The amount of general understanding of the S&OP process within LS, and MM, is varying. There is some confusion regarding what should be presented and what content that is important to air, and what presented data means for different roles in the meetings. Some of the roles present a more reactive set of information while some look further into the future. Apart from the general forecast there is little understanding of what the others bring to the table.

4.5.3 Measurements

The KPIs that is used by the different departments at Volvo Aftermarket is set by management at GTO and LS and is used to control the overall outcome of the business and is generally strategically aligned for example to generate low costs, high ROI or highest profit. The problem with the current set of KPIs used at Volvo Aftermarket is that they not always seem to be very cross-functionally aligned, as for example the Refill department have their goals for Forecast Quality (FCQ) and utilisation of airfreight or dayorders, whilst DIP might have the same but they do not conjointly optimise the total outcome of FCQ. In addition to the KPIs the different department sometimes use PIs designed more for the day-to-day business, as for example to use in decision material aid. The various KPIs are represented and managed through a KPI dashboard.

4.5.4 ICT Structure

If taking the stance of how information flows in the S&OP process at Volvo Aftermarket, it all begins at the interface with the various dealers, of which approximately 50% are owned and controlled by Volvo. As the dealer count, only for Volvo Trucks Corporation (VTC) exceeds 2000, and to that one need to add the dealers that handle the various other brands in the Volvo Group's Aftermarket, the SC gets rather complex to handle. To enable managing of S&OP Volvo uses a system of aggregation for information. The Information flow thus start with collection of data for sales etc. in a system called Dealer Service Package (DSP). Most dealers are rather well integrated in the system, especially those controlled by Volvo, and files from these are automatically uploaded and updated. Some dealers need to report manually through email or saving of the most relevant data in standard file templates, depending on the dealer's ICT structure sophistication. Data is then drawn from DSP to create sales forecasts for the dealer interfaces, which is made by Volvo's forecasting and delivery scheduling software. This system is currently undergoing a radical change due to the roll-out of SAP-SCM. The SAP integration will likely take many years to complete, and the schedule for the roll-out is different for different brands due to prioritisation.

The IT-tools used specifically for the S&OP is as of today not more sophisticated than the use of Excel spreadsheets and PowerPoint slides. Data before meetings get manually extracted and inserted into current PowerPoint sets of slides, that are shared through the common Teamplace. The manual work necessary for this process induce extra information lead-time, and data presented might have become obsolete when decisions about the process is taken. Due to the many different brands within Volvo there are several systems in use when extracting data where each brand has a unique system. The way data get presented might also differ depending on which department that is responsible. For the actual meetings, attendees situated in the same building meet in booked conference rooms, although people that sit abroad or at a distance can join meetings through Skype over Internet.

Due to the aggressive acquisition strategy that Volvo have conjured it suddenly holds in its portfolio many companies with various ways of conducting their business and accordingly

use different ICT-systems to do so. This means that consolidation of information and standardisation measures have been moving slow, which in affect also have slowed down the implementation of SAP-SCM for example.

4.5.5 S&OP Plan Integration

As depicted in the theoretical framework S&OP Plan Integration mainly describes the integration between demand plans and supply plans. In Volvo Aftermarket's case, the integration is rather asymmetrical in the sense that what sales sell simply supply needs to supply. GTS is as of now rather dis-integrated from the S&OP process and the input data from their department is considered with caution, same data that is represented in monetary value, a unit not really compatible with GTOs planning parameters. Hence is only the trends used as influence, and then only in some extent for forecast adjustment. This data quality is moreover considered by the S&OP participants to be unjustified, and the performance of the forecasts is not monitored, and might be based around GTS targets and goals rather than on actual forecasts.

DIP create the final forecast which is supposed to be the input plan for the Material Planning so that supplier capacity can be secured for upcoming period of demand. In order to create the best possible plan DIP needs input to their plan from other departments as well. The two departments which affect availability at the CW are GTS and Refill. While GTS hand over a monetary volume forecast, they generally do not hand over information regarding plans for upcoming campaigns and market initiatives in different regions. This can affect availability drastically and in order to cope with the campaigns DIP would need plans for upcoming campaigns so they can adjust their forecast accordingly. The Refill department are accountable for a large outgoing flow from the CW in Gent and can have a high impact on availability. Refill do not hand over plans for how much they are expected to order for upcoming periods, meaning that DIP have a hard time coping with variations in Refill ordering patterns.

5

Analysis

The theoretical framework is put to use to make an analysis of Volvo Aftermarket's current S&OP, which in this case specifically means a comparison between the described S&OP parameters, descriptions of the process and related maturity levels provided by theory. The relevant gaps that are identified are then subsequently systematically prioritised according to how viable filling of a certain gap would be and what outcome it would entail, as for enabling the creation of a structured plan for action.

5.1 Planning Parameters

The S&OP planning parameters from theory are here compared and analysed to those of Volvo and how they are being used.

5.1.1 Planning Horizon

According to theory the planning horizon depends on the context of a company and thus varies between different companies. Since S&OP and the budget have a relationship an appropriate horizon would be one year. Volvo's system creates a twelve months rolling delivery plan and forecast every week, but the scope of Flow Planning is set to be between three and six months. Further the theoretical recommendation is to plan at least one year ahead when dealing with a seasonal demand and according to Jonsson and Mattsson (2009) most companies plan one to two years ahead. Volvo has several brands where demand behaves differently and thus this is needed to be taken into consideration. Volvo Penta, a seasonal demand pattern, would preferably be discussed for more than three to six months outside of the systems delivery plan. For other brands where demand is not seasonal it might also make more sense to discuss farther ahead than a minimum three months.

Furthermore, the presented theory depicts that S&OP needs to be conducted on a strategic level to reach its full potential and hence facilitate strategic decisions, therefore the horizon of only 3-6 months or even 12 months probably is not enough. With the actual outcome of the planning horizon being 0-3 months, the S&OP process becomes very reactive instead of proactive. Planning according to the actual planning horizon is problematic due to some lead times being very long and thus disruptions can be expected to happen.

5.1.2 Planning Frequency

The theoretical recommendation is to hold regularly scheduled meetings every month. At Volvo there is a plan to hold Dealer Facing and Parental Warehouse meetings every month. The planning frequency within Volvo is thus aligned with the recommendations of literature. The scheduling of the meetings is planned such that the systems in use will be able to generate the latest data which is of high relevance.

The theoretical chapter also describes how event driven S&OP requires the company to hold meetings based on exceptional events, but this is not something which is taking place at Volvo. One could argue that event driven meetings might be used as a way to bridge some of the silo-culture, as the day-to-day cross-functional communication between departments at MM still see opportunity for improvement. Simply depicted, in case of an exceptional event the participants of S&OP could call for an extra S&OP meeting where such issue would be discussed as for what impact it would have and what mitigating actions is necessary for each participating function.

5.1.3 Planning Objects

The planning objects are grouped and segmented at Volvo, which is in line with the theoretical suggestions. Further the large number of articles requires segmentation in order for the team to better understand articles. The forecasts in the system are made on article level and then aggregated to a group level. The presentation of the overall forecast includes all the groups. During the S&OP meetings some of the groups are further discussed on an individual basis apart from the overall forecast. This allows the S&OP team to focus the discussion on a group level for the upcoming months.

5.1.4 Units of Capacity

During the planning of S&OP there are no considerations being taken into account concerning capacity. Mainly there are three areas where capacity can be considered important. These are supplier capacity, warehouse capacity and transportation capacity. During the S&OP process none of these are mentioned or analysed in detail. While Volvo has various ways to deal with capacity issues in warehouse and transportation capacity, managing issues with supplier capacity is the more difficult one. Supplier capacity is the main restriction on capacity, which impacts inventory levels and availability. These issues can occur when placing orders that reach the capacity limit but this is not otherwise considered. The supplier capacity can only be found on article level and not on an aggregated level.

Capacity should be considered in the S&OP process since it impacts the overall planning. The theoretical recommendation is to use a measure that can be compared to the planning object, which in this case is total volume units. Supplier capacity might be difficult to present in a tangible way, but maximum ordering per period could be a good way to present capacity. Warehouse and transportation capacity can for example be measured in terms of cost and personnel to understand how it is impacted. When capacity in warehouse and transportation is exceeded more personnel can be hired, additional space can be rented or

additional transportation companies can be contacted. Thus there is a flexibility in these capacities in overriding the current maximum capacity.

5.1.5 Time Fences for Changes in Plans

Theory recommends to use time fences with rules on when changes can be made and by how much. Further it should be related to the lead time of procurement of material and transportation. Volvo uses time fences in these manners, though not the entire assortment of articles but instead uses different time fences for different articles. These time fences are set up according to each article's individual lead time and transportation time which is agreed together with the suppliers. Further there are also guidelines for how much orders may change during a certain period, something which is agreed with each supplier. An example could be an article with an agreed lead time of six weeks in which orders can't be changed, unless specified in the contract, and this then becomes a time fence in the system. These time fences might be difficult to view in the S&OP discussions since they differ on an article level but a general time fence including the maximum and minimum article fence could be a good illustration for discussions regarding forecasting. The time fences should also be an incentive to push the team to discuss on a more strategic level over a horizon farther into the future rather than the near horizon.

5.2 S&OP Process

The following section makes the comparison between Volvo Aftermarket's S&OP process and the previously proposed theoretical framework, as for identifying opportunities for improvement.

5.2.1 Product Management Review

The process of new product introductions is managed by Spare Parts Engineering in a Phase-in project. This project is executed rather dis-integrated from the S&OP process. Hence when a product is launched and initial stocks are determined, the departments that are to assume the responsibility for stocking policies and that work with S&OP might struggle with determining accurate forecasts due to the fact that they do not have the same knowledge about the products.

The Spare Parts Engineering team could therefore benefit from working in closer collaboration with the departments controlling forecasting during phase-in projects, to create more accurate initial forecasts, preferably with a larger scope of horizon. A first step could be to standardise a way of storing and sharing information related to new articles that would help the forecasters that assume the role of stock-keeping. The process as of now work in a more re-active manner. First as initial stocks, which get determined by the Phase-in projects, start emptying out hence creating a depictable demand pattern, the stocks the forecasting system become able to adjust itself accordingly. If the system does not take enough consideration to trend-factors in the demand this would create backlogs. The output from the product management review meetings as presented by theory include matters like risks, arising issues, changes and necessary resources, which Volvo today do

in some extent, but the routines probably need examination and standardisation globally.

In the new to-be MM organisation a new role of Initial Planner is to be created that will affect the S&OP. This function will ease the introduction and initiation of new products and bridge the gap between the development and initiation of new products and the continuous inventory keeping of these. What tasks and activities the role entails will probably have great effect on how effective the Product Management Review stage of S&OP will be.

5.2.2 Demand Plan

Theory suggest that the creation of Demand Plan begins with the creation of forecasts. These are to be managed on a product group aggregation level and extend on a relatively long horizon. The theory also suggests the use of pre-meetings as part of the Demand Planning to include data about what likely will be sold, and how sales can be affected by planning of market initiatives, though the use of pre-meetings as the different regional S&OP structures are varying at Volvo.

Another issue is the quality of the forecasts delivered by GTS, which unfortunately are not measured and the reliability is questioned both by GTS themselves as well as MM. If the forecast data from GTS is to be taken seriously the Forecast Quality (FCQ) needs to be a PI that is continuously measured to enable improvement, establish quality and to what extent stock planners needs to take this into consideration.

The most common planning horizon in industry practice for sales is 6-18 months, and Volvo, i.e. GTS, in this case create sales plans for 12 months ahead at a quarterly frequency. The question of why not extending the forecast further into the future to 18 months or more once again arises, as the S&OP is to be a strategical process as well as tactical and accordingly facilitate decisions on strategic levels. An extended planning horizon would also be more effective for automatically detecting seasonality in products, which for an illustrative example can be considered especially relevant for some of Volvo Penta's products' demand profiles, due to the seasonality of the marine market. Suggestively the forecasts delivered by GTS should be accompanied by information regarding planned marketing initiatives. Sometimes information about these marketing initiatives launched up to national level reach MM with very short to no notice causing problems with availability. There are also benefits with being able to provide suppliers with plans with longer time horizon, as they with that information then would be better fit to make strategic decisions about capacity.

Another question arises about the process for planned market initiatives, as sometimes these come as a surprise to the material planners who struggle with providing the necessary volumes. So if GTS were to ensure compliance for inventory and global agreements about how the initiative likely will fall out before launch a lot of availability issues would be mitigated. Suggestively the process of creating and launching initiatives would contain stages of compliance check of inventory levels and at least that material planners are informed about market initiatives outside freezing period for majority of the certain products. There is currently a standardised way that initiatives launched by GTS are to be

messed to material management, but compliance of using this is varying.

Then there is also the question of where demand data is acquired. The demand data utilised for constructing warehouse forecasts origins not in EPOS-data at dealers, but rather in dealer orders from CWs and RWs for example. The dealer EPOS is only used for regulating inventory at the dealer. The reason for not using EPOS data more extensively is stated to be low data-quality, as some of the data needs manual input into excel-files as some dealers use their own systems for inventory keeping. Remains does though the question why EPOS data is not used, at least for catching trends faster, in those cases Volvo owns the dealers and the data quality is high.

5.2.3 Supply Plan

The theory regarding supply plans much correspond to what Volvo are doing now. The general idea is that the generated demand plan is considered while creating the supply plan. As Volvo aftermarket do not hold any relevant amount of production in-house, the production mentioned in theoretical frameworks corresponds more to Volvo Aftermarket's outsourced and procured supply of products. The Supply Plan hence become a plan for procurement, to be executed by the Material Planning department on a tactical level. If there is not enough supply capacity GTP will be tasked with securing more capacity in order to meet demand. As the infrastructure of products in different warehouses comprise a small supply chain in its own with separate entities responsible for its inventory, one could consider each interface comprising in a demand/supply relationship, i.e one supply/demand plan for each stage in this internal SC.

The fit between what is the supply plan, demand plan and which department does what function at Volvo compared to theory differ due to Volvo's organisational composition and how roles are dis-positioned. A lot of what can be considered rather as a part of the demand plan for sales and inventory keeping is managed by the departments of DIP, Refill and DIM, instead of GTS as purposed by theory.

5.2.4 Rapprochement

During rapprochement the intention according to theory is to reconcile the demand and supply plans, and this is where the respective departments would meet and agree on a set production plan, or as in Volvo's case more of purchasing and capacity plans. At these meetings, managers from the departments of marketing, procurement, financial and logistics department would agree on plans, that get aggregated to decision meetings with attending top management who can make final adjustments and consider the pricing capacity trade-offs. At Volvo these meetings generally regard decisions for adjustments of forecasts and capacity of transports and warehousing activities. The decision meetings as described in the results section is though unclear if they occur at all regions and for all brands, why the opportunity for improvement here likely lies in ensuring use of a global standard and checking for compliance.

The theory expresses the importance of including aspects of, and aligning with finance at

this point of the process, to ensure that S&OP do not confide at being only tactical rather than strategic. Finance representatives at Volvo aftermarket are not present in the official S&OP meetings of DF and PW, but first at the stage of decision meetings. The attendees of DF and PW meetings have also expressed that they do not see any apparent advantages of finance being present.

Theory also suggest the use of a S&OP packet as a way of consolidating the most relevant S&OP data previous to the decision meeting. In Volvo's case the concluding PowerPoint document generated during the PW work as a way of facilitating the subsequent decision meeting and other parts of the business that may need this information.

5.2.5 Measure, Communicate and Implement the Plan

The last stage of the S&OP process first composes of publishing the constrained plan to operations, i.e. as in Volvo's case finalising the delivery plan that get communicated to the suppliers. This is a process facilitated by Material Planners that handle the supplier interface and manage compliance. The operations then are to be continuously measured in form of chosen KPIs like revenues, cost, inventories, profitability, customer service, forecast accuracy and so on, something Volvo are working with that get updated at their online KPI dashboard. The theory also suggests measuring the S&OP process explicitly to enable continuous improvement, which is not applied for Volvo's process.

5.3 Volvo S&OP Maturity Classification

Following section both describes the current maturity and suggests fill-able discrepancies and gaps that can be evaluated in the To-Be section. The content is structured around previously synthesised framework consisting in the five dimensions of Meetings and Collaboration, Measurements, Organisation, ICT Structure and S&OP Plan Integration. The assessed maturity for each dimension is then summarised in a figure composed of the synthesised maturity framework as presented in theoretical framework, which are found in the end of the dimension analysis. The figures contain colour coding which indicate the level of fulfilment of a certain maturity stages criteria, the colour green indicating fulfilment, grey indicating partial fulfilment and red non-fulfilment. The aggregated level of fulfilment for all the dimensions is then illustrated in a radar-diagram in following chapter for recommendations. An example of the calculative procedure for the values illustrated in the radar diagram can be found in Appedix A.1.

5.3.1 Meetings and Collaboration

This dimension measures the level of effectiveness and efficiency of human participation and integration in the S&OP process.

Maturity

At stage one of this dimension the business is conducted in a silo manner, and neither collaboration or meetings occur that treat S&OP. Stage two companies only discuss S&OP at top management level, with focus on financial goals, and meetings occur only sporadically and non-planned, and effort in preparing material is lacking. These are two maturity stages Volvo clearly pass, meetings are well planned, material is well prepared and meetings do not occur only on top management level. Stage three as according to the framework indicate some use of pre-meetings, dedicated meetings for executives, and use of some supplier and customer data in the planning. The frequency and planning of meetings is not chaotic, and Volvo hence passes this stage as well.

Stage four of the framework is focuses on how well customers and suppliers are integrated in the meetings and what data from these gets used for the planning. Here Volvo have incorporated only fragments of data from customers. Customers, if considering dealers being the main customers, are partially integrated in the process through the Dealer Facing meetings. The size of the dealer base makes need of rationalising information aggregation methods, as all dealers cannot participate on these meetings. The participation differentiation is based on size and how important the dealer is. Here the meeting structure of Dealer Facing meetings and Parent Warehouse meetings aids in the aggregation of information, aspiring on transferring the most important operational information upwards to strategic level, stepwise. Information about the supplier side is less incorporated, and this side of the supply chain is forced to act more re-actively, and in the S&OP process little is known about the real capacity of suppliers. Following Figure 5.1 as transferred from theoretical framework, is accordingly complemented with maturity grading based on empiric data followed by gaps discussion.

Meetings and Collaboration

Stage	Grimson & Pyke	Other
1	- Silo culture - No meetings - No Collaboration	
2	- Discussed at top level management meetings - Focus on financial goals	- Lapide (2005): Chaotic and sporadic schedule for meetings, that get frequently cancelled. - Lacking effort for preparation of material
3	- Staff Pre-meetings - Executive S&OP meetings - Some Supplier/Customer data	- Lapide (2005): Increased meeting frequency
4	- Supplier & Customer Data incorporated - Suppliers & Customers participates in parts of meetings	
5	- Event driven meetings supersede scheduled meetings - Real time access to external data	- Lapide (2005): Keep meetings at a minimum and let S&OP Workbench initiate event-driven meetings when necessary.

Figure 5.1: Meetings and Collaboration Maturity Evaluation

Gaps

One can hence conclude that what is left to reach full level four maturity according to the framework, is more incorporation of both customer and supplier data, and especially supplier data. The theory also suggest that at least Key customers and suppliers are invited to

participate in in the process at stage four.

Above that the attendance at the S&OP meetings still see opportunity for improvement. Some participants skip out on regular basis due to attitude problems, and hence the importance of the meeting needs to be emphasised, if the meetings were not important they would not be held or been held in another manner. If someone chooses to not attend this also implies a non-willingness for accountability, which of course is unacceptable.

Stage five maturity suggest a transition from only planned meetings to more event-driven meetings. At full stage five maturity the planned meetings are unnecessary and focus lies only at the event-driven meetings, likely initiated by a sophisticated ICT-structure and S&OP Workbench.

5.3.2 Organisation

The dimension of organisation treats the corporate structure facilitating the S&OP, i.e. what departments are participating in the process and in what manner.

Maturity

Stage one companies do not have any formal S&OP organisation, and there is no know-how about how the process can be executed. Stage two maturity implies that S&OP affiliates yet not are empowered to execute decisions taken in the process, roles of the participants are undefined, people are not accountable for performance, executive support is low, and there is still little to no understanding of the process. Volvo cover these stages.

Stage three companies have S&OP executed in other roles, as supply or demand managers for example, and do not have a dedicated S&OP team. The S&OP participants are typically empowered and accountable, and the process has a clear process owner. Who owns the process at Volvo is unclear, but those who are involved in the process are empowered to make operational decisions in their respective department.

Stage four companies have a formal S&OP team and executive participation. Further they have empowered attendees with cross-functional composition. The participators have sufficient know-how for how to execute advanced S&OP and other activities like risk management. Volvo in this case actually have formal teams for conducting S&OP globally. The participation of executives in S&OP is partially there through the use of decision meetings and sign-off meetings that follow. Following Figure 5.2 as transferred from theoretical framework, is accordingly complemented with maturity grading based on empiric data followed by gaps discussion.

Organisation

Stage	Grimson & Pyke	Other
1	- No S&OP organisation	- Wagner et al. (2014): Lack of Know-How
2	- No formal S&OP organisation	- Wagner et al. (2014): S\&OP affiliates are yet not empowered to make any affecting decisions.
	- Components of S&OP in other positions	- Roles are not clearly defined. - People are not held accountable for plans and performance, lack of ownership. - Little to no executive support - Low knowledge about the process and how to execute.
3	- Formal S&OP is part of other position: Product manager, Supply manager, but there is not a dedicated team.	- Wagner et al. (2014): Typically empowered attendees. - Partially accountable participators. - Clear S&OP-process owner.
4	- Formal S&OP team	- Lapide (2005): Cross-functional and empowered attendees.
	- Executive participation	- Wagner et al. (2014): Sufficient Know-How to execute advanced S\&OP and additional activities like Risk management
5	- Throughout the organisation S&OP is understood as a tool for optimizing company profit	- Lapide (2005): High level of supply chain integration, whereas collaborative input is automatically drawn from customers and suppliers detecting imbalances
		- Wagner et al. (2014): Top management commitment both internally and from SC-partners. - Employees and management continuously strive for improvement

Figure 5.2: Organisation Maturity Evaluation

Gaps

The decision meetings are not part of the official S&OP documentation directives, and is therefore not assured to be executed or executed in the same way globally. The decision meetings are also distanced chronologically from the official process, and the majority of those attending the S&OP meetings described by the process description are not participating in the decision meetings.

The project treating the S&OP process likely increased know-how of how to be conducting a more advanced S&OP, though this is apparent while conducting this thesis that company-wide coherent knowledge of how to do this is missing. An indicator for non-comprehension is sporadic and non-coherent attendance, as one cannot grasp the importance of an action, the purpose and benefits stay unclear and as a result the activities remain non-prioritised.

The level of cross-functionality at Volvo is also subject for evaluation, as GTS who provide with sales forecasts only attend some of the DF meetings and do not deliver sales forecast data compatible with the forecasting systems running at MM. These forecasts do not cover all brands either. Hence forecasts are mainly based only on previous sales. The cross-functional collaboration can also be improved as some departmentalisation is apparent as observed both between DIP and Refill and between MM and GTS.

Stage five companies consider that S&OP in itself is a means to an end to achieve optimised company profit, and all suggested participants understand this. When Volvo conduct their S&OP meetings the focus is dominated by each department’s KPI, and not profit. The cross-functional integration of stage five S&OP processes imply a more seamless sys-

tem that is able to extract, compile and analyse data from involved SC-entities. There is also signs of big top management commitment, not only inside company borders but also from key customers and suppliers. In the process there is also included integrated elements which promote continuous improvement.

5.3.3 Measurement

This dimension treats measurement both covering the S&OP process specifically, but also over-all corporate measurement structure and alignment of KPIs between departments.

Maturity

At stage one of the synthesised maturity matrix dimension for measurement, companies do not utilise any measuring but standard financial accounting. Stage two companies measure how well operation meets sales, Order Fill Rate, Inventory Levels and Asset Utilisation. Further, the information flow between sales and operations is still very asymmetric and operations are confined to comply with what sales sell, all which Volvo complies with. At this stage the KPIs are also based upon the silo mentality, and stay cross-functionally unaligned.

Stage three implies measuring of sales forecast accuracy, here Volvo partially complies. The performance of the sales forecasts that the sales department GTS provides into the S&OP process is not measured in accuracy. So how much they actually can trust these forecasts is difficult to assess. Then there are the forecasts generated by the system that controls the different warehouse inventory levels, these are measured in the KPI of FCQ for the CWs. At this stage there is still some nonalignment of KPIs between departments, a state where in which Volvo can be considered to be today. Mentioned is also that there are some initiatives for measuring S&OP at this stage.

Stage four add measuring for performance of new product introductions, and S&OP efficiency. Mentioned KPIs are Demand Error, Customer Service, Capital Costs and Total Cost. The KPIs for different departments are also well thought through and fully cross-functionally aligned, alternatively with incentives and bonuses related to positive behaviour. At this stage the S&OP process also utilise irregular S&OP benchmarking to enable improvement. The demand error, customer service and capital costs are integrated both at executive level and in some extent in inventory-optimisation. The Dealer Service Index (DSI) describes the service at Volvo's dealers, and the inventories for different product classes can be optimised for achieving a certain DSI level in the system. Other KPIs mentioned in the framework related to stage two are Order Fill Rate and Inventory Turnover Rate, which are included in Volvo's KPI dashboard. Following Figure 5.3 as transferred from theoretical framework, is accordingly complemented with maturity grading based on empiric data followed by gaps discussion.

Measurements

Stage	Grimson & Pyke	Other
1	- No measurement	
2	- Measure how well operations meets the sales - Asymmetric information flow between sales and operations. Operations are limited to adapt.	- AMR Research (2009): Order fill rate, inventory levels, asset utilisation - Wagner et al. (2014): Non-aligned Basic KPIs that are sporadically measured.
3	- Sales measured on forecast accuracy	- AMR Research (2009): Order fill rate, forecast error, inventory turnover rate - Wagner et al. (2014): Partially aligned KPIs, that are measured regularly, with some incentives that are related. - Inconsistent S&OP efficiency measuring
4	- New product introduction - S&OP Effectiveness	- AMR Research (2009): Demand error, customer service, working capital, total costs - Wagner et al. (2014): Full alignment of KPIs cross-functionally and bonuses that are related. KPIs for S&OP efficiency. - Irregular internal S&OP benchmarking.
5	- Company profitability	- AMR Research (2009): Demand risk, customer service, cash flow, market share, profit - Wagner et al. (2014): KPIs that also accounts for SC-efficiency and efficiency of SC-partner tiers. - Regular Internal and external S&OP benchmarking.

Figure 5.3: Measurement Maturity Evaluation

Gaps

First gap can be identified at stage three where sales forecasts from the Sales department GTS at Volvo, are under-utilised and data quality non-controlled. Furthermore the forecasts are presented in a unit that is hard to interpret by the systems controlling inventories, as these forecasts are in monetary value with for example included exchange-rate compensations, and the inventory control system is based on part number volumes. To achieve higher maturity, the forecasts' quality needs to be continuously evaluated to reveal which process commissions and improvements utilise positive effect. The question who really owns the responsibility for the forecast also arises, as GTS produce one forecast, which get interpreted and realised by MM, then there are the forecasts for the different warehouses. These forecasts could alternatively be considered as unconstrained and constrained respectively, which is fine, GTS' forecasts still though need quality measuring.

New product introduction in the S&OP is an area that Volvo is currently working with improving through introducing the role of Initial Planner. The composition of PIs this role owns will affect how well the transition from initial inventory to continuous forecasting and stock-keeping proceeds, i.e. how balanced service levels and inventory cost get.

The cross-functionality and composition of KPIs for different department and what gets presented at S&OP meetings, needs evaluation. As a clear example the Refill department reports the index for Air-freight share in their transports, something that does not really affect the other departments.

At stage four companies have also started to measure the S&OP efficiency, i.e. how well the process progresses according to the process directives, as well as what impact dif-

ferent decisions may have on profit. Decisions taken at decision meetings for example, does not really get systematically evaluated. What effects have decisions about forecast adjustments had? Were they made as informed decisions, can this process be improved, is more relevant or accurate in-data necessary to get better? Measuring is non-arguably necessary to improve. This is also one of the reasons why the use of balance scorecard might be prosperous to investigate, as this would entail a structured way of controlling and measuring the strategic performance of the business as well as the success of S&OP, and S&OP initiatives. There have been some indications that the KPI structure as a whole needs reviewing, most apparently the cross-functional alignment could improve. A review of the KPI alignment though lies outside the scope of this thesis.

At stage five company profitability should be the main driver for S&OP decisions, which implies the need for systems taking better account for financial outcome from certain decisions, i.e. scenario analysis with financial optimisation. Stage five also implies more know-how of adjacent SC-entities and how business can be conjured with better harmonisation. Volvo today own many of the Dealers and hence have good insight in this side of the SC. Suppliers is a different story, as they generally are more inclined to follow what Volvo decides in form om volumes etc, and inter-company harmonisation is not optimal. There are though functions at Volvo that handle the supplier interface to care for these relationships, but the suppliers are still very dis-integrated from the S&OP process. At stage five benchmarking of the S&OP process itself have been incorporated and standardised into the process, as part of the continuous improvement.

5.3.4 Information Systems

This dimension treats the different tools that are used to facilitate the S&OP process, front and foremost being Information Technology.

Maturity

Stage 1 of the dimension information systems is a very basic and limited use of spreadsheets which are not shared among departments. While Volvo uses spreadsheets and PowerPoint to gather and present data, they do share these spreadsheets among the departments through an internal communication portal. In stage 2 these spreadsheets could get consolidated and Volvo generally consolidate their information.

Stage 3 depicts a standardised and centralised process for data gathering and presentation. This process may be supported by some software which though is not the case at Volvo. Volvo do have a central gathering point for the spreadsheets and PowerPoint sheets but no software allowing for an automatic process. The planning process is supported by a system that generate forecasts and delivery plans. The planning systems at Volvo are tuned to achieve a certain customer service level for the different segments of products, for which inventory levels are adjusted to achieve, without generating to much inventory keeping and capital cost, which indicate some aim to achieve a total cost perspective. The different software suits at Volvo aftermarket are all more or less connected and harmonised, though software connecting material planning and revenue optimisation are though not

5. Analysis

concurrently optimised. Parts of the system at Volvo is also in some extent designed to alert in case of bigger deviations in for example forecast or very large manual orders. In stage 3 also the matter of how data from customers and suppliers are incorporated is treated. At this level relevant data is more or less manually aggregated and presented at meetings.

For higher maturity a more standardised and automated process for gathering this kind of data is necessary. VTC for example are able to extract data in a standardised way from a majority of their dealers that they own. The independent dealers are more difficult to convince to send quality data in a standardised format likely due to relationship power-imbalances. How the process looks today only the most relevant data about dealers are aggregated through the DF meetings and only for the dealers that are differentiated to be of higher importance. Following Figure 5.4 as transferred from theoretical framework, is accordingly complemented with maturity grading based on empiric data followed by gaps discussion.

Information Systems

Stage	Grimson & Pyke	Other
1	<ul style="list-style-type: none"> - Individual managers keep own spreadsheets - No consolidation of information 	
2	<ul style="list-style-type: none"> - Many spreadsheets - Some consolidation but done manually 	
3	<ul style="list-style-type: none"> - Centralised information - Revenue or operations planning software 	<ul style="list-style-type: none"> - Lapide (2005): Collaborative information from important customers or suppliers presented at meetings - Sales' software connected with operations' though not concurrently optimised - Wagner et al. (2014): Inconsistent and manually entered data from other systems, which is not entirely harmonised throughout the organisation.
4	<ul style="list-style-type: none"> - Batch process - Revenue & operations optimization software - link to ERP but not jointly optimised - S&OP workbench 	<ul style="list-style-type: none"> - Wagner et al. (2014): Automatic plan adjustments. Harmonised Master data throughout the organisation. - System triggers automatic alerts in case of unexpected deviations
5	<ul style="list-style-type: none"> - Integrated S&OP optimisation software - Full interface with ERP, accounting, forecasting - Real time solver 	<ul style="list-style-type: none"> - Wagner et al. (2014): Supply chain partners integrated in system. All relevant data available(incl third party capacity data) - IT-systems completely aligned throughout the SC.

Figure 5.4: Information Systems Maturity Evaluation

Gaps

Within stage 4 there should be a standardised and automatic process for sharing data internally. While Volvo uses an internal communication portal there is not an automated way of gathering and sharing of information with IT resources. The way data gets presented may need reviewing. Different departments may use different data representation methods, with graphical data that is very specific and in some cases complicated to depict and

understand.

The gap is the absence of software to support this mechanism. Further in stage 4 the software used is a form of S&OP workbench which should tie operations and sales software together to consolidate information and make it easily available to facilitate the S&OP process. Volvo has quite a complex setup of its supply chain and with all the different brands that LS is serving, a more advanced IT system with more functional coverage able to assume a role concurrently coordinating functions for demand and supply planning, would aid the process. As the roll-out of SAP suite proceeds, the advantages of including their S&OP module might become apparent which probably is viable to investigate.

In addition to current data about products there might also be advantages with starting to classify products in the system according to how competition sensitive they are. This way risk of lost sales can be mitigated through higher inventory levels for these products. Oils for the Penta brand being a good example, where the availability at the market, from alternative producers is high.

At the highest level of maturity, the IT system would be able to facilitate the use of continuous scenario analysis and optimisation for sales and operations, and simultaneously consider changes in for example order costs, currency, over-all economic climate, and at a level that cover more than the internal supply chain of Volvo.

5.3.5 S&OP Plan Integration

How and which plans in the S&OP process are integrated, and particularly the alignment of sales plans and operations plans.

Maturity

Stage 1 of the S&OP plan integration dimension involves no formal planning and just leaves the operations to attempt meeting incoming orders. Volvo is not on this stage and is more mature, but the department Refill do fit the description since they have no formal planning and on a more operational level deal with incoming orders. Since Refill is a part of the S&OP their structure does affect the outcome of the process.

Stage 2 is somewhat fulfilled, being that the capacity utilization dynamics are ignored in the process. On the other hand, the sales plan might drive operations but does not necessarily do so and the process is not a top-down process. The sales department GTS is distanced from the S&OP process and therefore their impact is less on the outcome. Since the plans of GTS and DIP are in different unit measures there is a difficulty in integrating plans.

For stage 3 the plan integration still is very sequential, and the sales plan simply drives what operations or suppliers need to do. This is the case at Volvo, where the forecasted sales plan generates a delivery plan that is just transferred to the current suppliers. What capacity limitations suppliers might have is initially ignored, and if there is a supply deficit,

this is a problem that is solved re-actively by finding new suppliers or convincing current to increase their supply-ability. This system where information from suppliers about their real capacity is disintegrated from the S&OP process can generate backlogs. The plans are as in Volvo’s case controlled by targets for service levels and inventory keeping for certain product segments, then the forecasts are generated according to these principles, which are then agreed upon and adjusted and tampered to fit the business targets on decision meetings and confirmed through sign-off meetings. The planning process hence becomes top-down-up conforming with this level of maturity.

In stage 3 there are some plans that get further integrated, although not to an equal extent. The plans for new products, life cycles, capacities, price changes, risk and promotions might be composed with varying quality for each variable. For example, promotions are not included in the scope of LS, but instead GTS is responsible for these plans and while they might be planned they are insufficiently incorporated into the S&OP process. Some of the mentioned variables are planned and incorporated better than the others, but mostly they are not well enough incorporated in the process. In regard to this the plans are considering most of the product families, leaving out only the inactive parts. The discussion in the process may be concentrated more at some product groups that get bigger focus due to critical lead times or current critical situations. Following Figure 5.5 as transferred from theoretical framework, is accordingly complemented with maturity grading based on empiric data followed by gaps discussion.

Plan Integration

Stage	Grimson & Pyke	Other
1	<ul style="list-style-type: none"> - No formal planning - Operations attempts to meet incoming orders 	
2	<ul style="list-style-type: none"> - Sales plan drives operations - Top-down processes - Capacity utilization dynamics ignored 	<ul style="list-style-type: none"> - Wagner et al. (2014): new products, life cycles, capacities, price changes, risk management, and promotions get planned, but not incorporated in the S\&OP. - Only a few SKUs/product families are considered.
3	<ul style="list-style-type: none"> - Sequential process in one direction only - Bottom-up plans, tampered by business goals - Some plan integration 	<ul style="list-style-type: none"> - Wagner et al. (2014): new products, life cycles, capacities, price changes, risk management, and promotions get planned, partially and insufficiently incorporated in the S\&OP. - Most SKUs/product families considered.
4	<ul style="list-style-type: none"> - Plans highly integrated - Concurrent and collaborative process - Constraints applied in both directions 	<ul style="list-style-type: none"> - Wagner et al. (2014): new products, life cycles, capacities, price changes, risk management, and promotions get planned, and sufficiently incorporated in the internal S\&OP process.
5	<ul style="list-style-type: none"> - Seamless integration of plans - Process focuses on profit optimization for whole company 	<ul style="list-style-type: none"> - Wagner et al. (2014): new products, life cycles, capacities, price changes, risk management, and promotions get planned, and completely incorporated in the full S\&OP process. - SC-partners integrated in the S\&OP alignment process.

Figure 5.5: Plan Integration Maturity Evaluation

Gaps

If suppliers’ planning systems were better integrated with Volvo’s, information related to

capacity problems could be discovered more promptly and accordingly mitigated. Sales plans deriving from GTS needs to be on a such granular level that segments or products can be recognised in what volumes. This hence need to become a process, that follow a process standard that allows for continuous improvement, i.e also include measuring. Furthermore, the routine for transferring information to the S&OP process about certain market measures needs to be more emphasised. Many times MM get knowledge about marketing measures only a day before execution or if at all informed about them. This of course generate bullwhip effect through the supply chain both intra- and inter-company wise.

Stage four companies have plans that are highly integrated in a process that is collaborative and concurrent with constraints applied in both directions. Volvo do not really apply constraints on their plans, they simply sell what they can and their suppliers do what they can to supply this need. This way the most of the demand might be fulfilled, but the overall supply chain efficiency get ignored. If the supply of a certain product is low, a market initiative for this product gets unsuitable for example. If instead plans were more balanced, opportunities can appear that when a supplier can provide with a certain product for an attractive price, a market initiative could be made accordingly.

Constraints regarding transportation, personnel and warehouse space are not taken into consideration either. If Volvo are to order larger quantities more space can be rented, overtime can be incurred and random transportation purchases can be made without a formal contract. However, if it is noticed that something is constraining over a longer period purchasing will be involved and secure capacity, which increases the constraint limit. This is also related to the length of the planning horizon, whereas CWs and RWs are reduced to act more reactive than proactive due to the short perspective conducted in S&OP and planning generally. Thus, the breach of constraints is discovered when they have occurred and not before.

Stage 5 companies have a very high level of integration of plans in their S&OP process and focus on profit optimization for the company. This requires involvement and dedication from several departments, including finance, to find scenarios and decide from a profit perspective what to do next. The plan integration is more focused on creating business cases for different choices the S&OP team can make on a longer horizon. At this stage the company's important supply chain partners are integrated to align goals and actions, which should include some suppliers and some customers.

5.4 Gap Summary

In this section the identified gaps get summarised and discussed. The aim of this section is to identify gaps that can be filled, to improve the S&OP process.

The gaps in each S&OP dimension are summarised in Figure 5.6, depicting the overall maturity according to the synthesised maturity framework. The summary was designed for indicating where opportunities for improvement can be found, as well as a tool prospectively for comparing and benchmarking with S&OP processes conducted elsewhere, for

example other S&OP processes within Volvo or other companies in the industry. The analysis construction is based upon the concept of one stage comprising of ten points, hence full maturity would indicate a 50 point score out of 50 possible. If one dimension stage contains 5 factors, each of these correspond to 2 points on fulfilling. If a factor is considered as partially fulfilled, which is depicted in grey colour, the points for that factor is halved hence utilising 1 point. The evaluation is thus based upon each dimension summary made in the analysis under each gap analysis. The colours beside each gap indicate fulfilment or not, green indicating fulfilment, grey partial fulfilment and red non-fulfilment. For each stage therefore the percent of gap fulfilment under each stage comprise the score for that stage, and all scores are summarised and then is illustrated in following radar diagram in Figure 5.6. The method for summarising the score for one of the dimensions is illustrated in an example in appendix 1 A.1

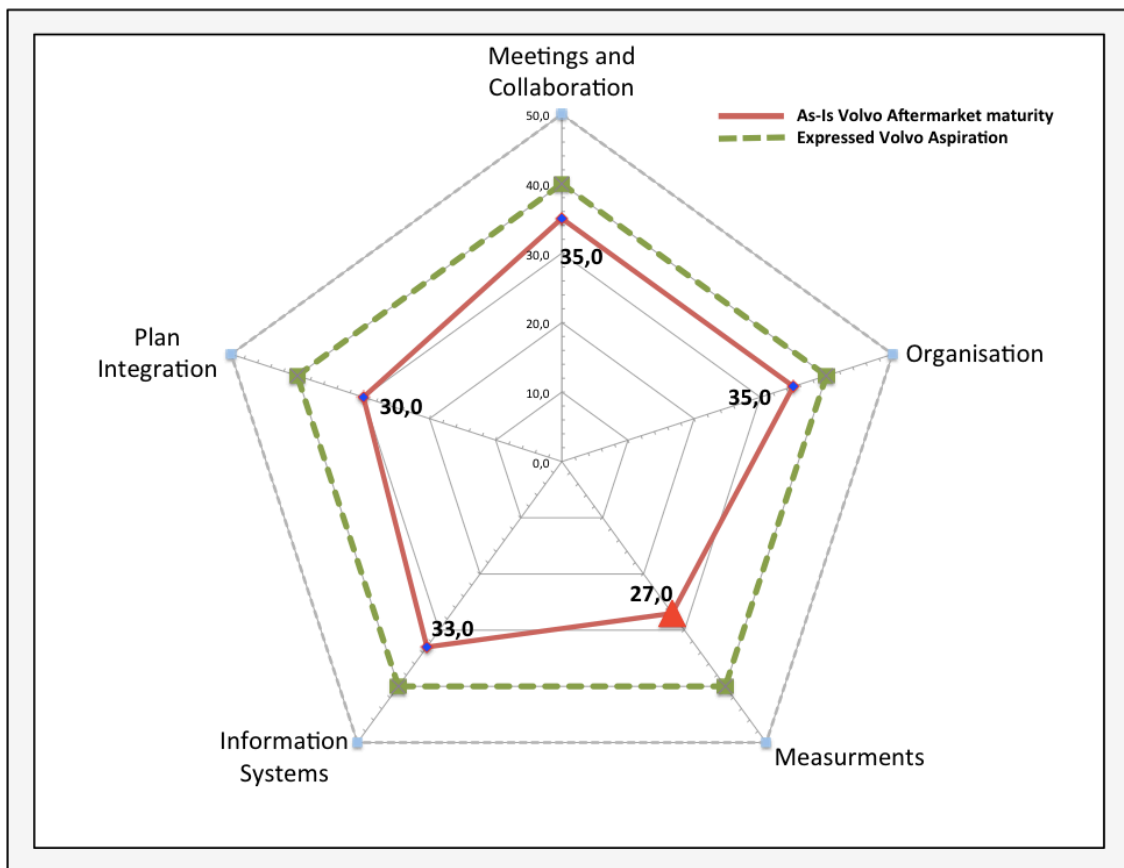


Figure 5.6: Maturity Evaluation Radar Summary

What can be discovered is that the over-all maturity is in the vicinity or above stage 3, i.e. average is 32 which translates to 3.2 according to the 1-5 maturity stages presented by Grimson & Pyke (2007), and the only dimension apparently not reaching average above stage three is the measurement dimension. Overall Volvo hence seem to conduct their S&OP successfully as earlier expressed, where "Meetings and Collaboration" as well as "Organisation" dimensions with 35 points each stand out.

The aspirational aim expressed by Volvo at the initiation of the thesis project was to evolve towards more advanced S&OP which in accordance with Grimson & Pyke's (2007) original framework correspond to stage 4 of maturity, this hence constituted an aim for this thesis. Whether stage 4 should be Volvo's long term aspiration or if rather stage 5 maturity should be, depends somewhat on what Volvo want to achieve with the process. The authors suggestion is to weigh costs of improvement initiatives with the prospective gains in profit, for each certain gap filling measure, and not blindly look for higher maturity of a certain maturity framework. Hence the framework should rather be a means to an end for identifying fill-able gaps, and whether to fill them or not should be more case to case depending on the context and prerequisites. Volvo's current maturity aspiration for stage 4 is illustrated as the green dashed line in Figure 5.6. It is though obvious that some of the measures to bridge identified gaps claim more resources and effort than others, and it is therefore necessary to prioritise between available options. Even if the total score exceeds stage three there are gaps within stage three for the "Measurement" dimension, which could be interpreted as a priority to fill suggestively. Volvo's target to achieve stage four level of maturity indicating advanced S&OP, have been partially taken into consideration when designing the recommendations presented in following chapter. Although what gaps to fill is not to be determined only with the target to reach a high level score but rather through identification of the most beneficial options with consideration to such parameters like effort, cost, implementation and opportunity for result. Making a complete separate business case for each gap though lies outside of the scope of the thesis. Due to the immensity of gaps to fill that are identified through the maturity framework, participants in the S&OP process at Volvo were consulted through the use of separate workshops and dedicated interviews in an attempt to achieve consensus on what gaps are most important and for which solutions should be generated. Presented for the people involved in S&OP were gaps deemed more or less viable to fill in a shortlist. By summarising the different opinions a final list of gaps was concluded. The carrying out and final solution construction responsibility, majorly lies in the hands of Volvo and process owner, though the authors of this thesis made their informed suggestion. Accompanied with the suggested improvement actions is the authors intake on what dimensions that likely would be affected by the certain measure, which get presented below.

- **Measure FCQ on GTS forecasts**
Measurements
- **GTS to inform MM about marketing initiatives**
Plan Integration
- **Measure forecast bias**
Measurements
- **Checking process compliance**
All dimensions
- **Standardise templates and procedure**
Meetings and Collaboration, Information Systems, Measurements
- **Change process name and clarify ownership**
Organisation
- **Extend process description with decision meetings**
Meetings and Collaboration, Organisation

- **Balanced Scorecard**
Measurements, Organisation
- **Basic scenario analysis**
Measurements, Plan Integration
- **Refill order plan**
Plan Integration
- **S&OP Workbench**
Information Systems
- **Advanced scenario analysis**
Information Systems, Plan Integration, Measurements
- **EPOS data as input for trend compensation**
- **Segment products according to competition sensitiveness**

5.4.1 Gap Analysis

All gaps cannot be filled initially, hence remaining gaps have been excluded in the following chapter concluding the recommendations. The major reasons comprise of cost, effort and non-compliance with other business processes and organisational structures at Volvo that is related to the internal and external context. To comment specifically on the context variables affecting these decisions, there are a couple of main characteristics of Volvo Aftermarket that have been considered.

5.4.1.1 Internal Context

Organisation and Brand structure

Volvo Group comprise of several brands originating in separate companies. Even if Volvo claims and aims to become a global and coherent organisation with standardised way of conducting business across the different brands, this is a process that will take a lot of time and effort. By emphasising the way processes are documented and by controlling as well as monitoring the execution compliance, one will be able to strive continuously for this aim. Still though the different brands have different systems facilitating their processes, and in case of IT-investments for example the integration complexity increase with the more systems to integrate. This is clearly the reason why the implementation of SAP for example takes so much time and time to completion even seem to continuously increase. This is not to say that these efforts might be of non-use, the brand integration would likely be very benefited in the end. Though suggesting implementing full S&OP ICT solutions become non-viable. Volvo also have a certain way of handling IT related implementation and commissions, whereas it has a separate budget, and getting a commission executed in IT is considered more difficult than other innovations and improvement implementations.

The brand structure also affects the re-organisational possibilities. Organisations in the different brands are in some cases different, and re-organisation efforts for facilitating S&OP specifically is hence not viable out of cost and effort reasons. Although global standards for sub-organisations are beneficial out of other reasons as well. Due to several internal context characteristics gaps in the IT dimension become difficult to fill. Another example is a gap from the Plan Integration dimension. The gap of concurrent and collaborative process becomes difficult to fill due to the high amount of brands and the

organisational structure. Within the S&OP process filling this gap would require a more collaborative approach from different divisions within the Volvo Group which becomes very hard to achieve. However due to the IT systems present at Volvo a gap much related to external context is easier to fill due to the infrastructure available. This gap is from the Meetings and Collaboration dimension and regards incorporating supplier and customer data. Had it not been for the present IT systems this gap might have been impossible to fill.

Product assortment

Volvo Aftermarket currently deal with number of parts in the vicinity of 600 000, which clearly affect the possibility to discuss parts on much granular level. The number of parts also imply the use of a high number of suppliers, hence the ability to have complete control over their capacity becomes difficult.

5.4.1.2 External Context

Aftermarket characteristics

As the demand pattern is mainly originating from orders generated from breakdowns and service calls, it induces a demand that needs to be filled rapidly as to not cause customer downtime. This implies a very inventory dense distribution to maintain high service levels and make to stock production strategy. Hence the planning becomes focused around inventory and demand patterns. Not providing with a product to the end customer generally is not an option due to service agreements, the supply side is confided to comply hence the integration of supply and demand plans become very one-sided and sales plans do not get changed due to supply capacity changes. If there is a lack in supply capacity a new supplier is identified and installed in the supplier base.

Upstream

The extensive number of products offered by Volvo Aftermarket also affects the number of used suppliers. Hence the integration of supplier systems becomes very complex. The number of suppliers also limits their organisational integration in S&OP, why the possibilities for attendance at meetings suggested by theory become decreased. This is one gap that is not suggested to be filled in the Meetings and Collaboration dimension of the maturity framework.

Downstream

With all the different brands in the Volvo Group comes a large number of dealers to reach the end-customers. While dealers may vary in size and importance it is still difficult to include them in direct discussions in the S&OP process. DIM is responsible for gathering information from dealers, in excess of the system data, and sales are responsible for market intelligence surrounding the dealers. The dealers are spread out globally and given the total number of dealers across all the brands, direct inclusion in the S&OP process would become a complex matter to manage. In similarity to the external upstream context the gap specifically linked to incorporating customers organisationally is not suggested to be filled.

5.4.1.3 Gap classification

In order to create a list of recommendations to Volvo LS regarding the S&OP process, the identified gaps first comprise areas of improvement, indicating that one recommendation point could include and comprise of several gaps. As the gaps were presented and discussed in workshops and interviews, several improvements were identified and further segmented into five areas. These areas regard if they are possible to realise, on what horizon they would be able to be realised and if there are other improvements which would aid the overall improvement. These areas are *Low Hanging Fruit*, *Mid Term*, *Long Term*, *Other Improvement Areas* and *Left Out*. The improvement areas from these categories are presented in chapter 6, Recommendations, with the category *Left Out* not being included in the chapter.

Low Hanging Fruit

This category consists of improvement areas which can be focused on during a short term perspective and that have a high enough importance to be focused on during a shorter term horizon. The improvement areas do not require high investments nor a need to look for support further up in the company hierarchy. Given the context of Volvo LS, these improvement areas can be a good starting point for improving the S&OP process. The recommended improvement actions in this category will affect all dimensions, with the dimension Measurements being the most affected one. For example, measuring FCQ on GTS forecasts will improve the measurements dimensions since it fills the gap of measuring sales forecast accuracy.

Mid Term

This category includes improvement areas that need focus over a longer time horizon than the *Low Hanging Fruit* category, because of their required attention and managerial involvement. Still they do not have the need for high investments or support from further up the company hierarchy. These improvement areas need time in order for Volvo LS to evaluate how they should be carried out and what implications this will have on the S&OP process. This category mostly affects the dimensions measurements, organisation and plan integration. By for example creating refill order plans this will affect the gap of plans highly integrated in the dimension plan integration. While it may not be enough to completely fill the gap it will have a positive effect of integrating plans overall.

Long Term

This category includes improvement areas that require high investment, support from higher up the company hierarchy and time to implement. Given the complex context, which is apparent within the Volvo Group with all different brands and high number of products in the aftermarket, these improvement areas are difficult to implement and manage. These are areas which include gaps that are important to close but they will require higher effort from the company. This category affects the dimensions information systems, plan integration and measurements, with information systems being the most crucial dimension when considering gap filling. This dimension may require investments and time in order to create an effect, but with it comes gap filling in the dimensions plan integration and measurements.

Other Improvement Areas

These improvement areas are not directly found as gaps in the theoretical framework, but their nature can affect the outcome of the S&OP process. The time horizon for these improvements is not given and the investments required for them is not known. The areas can provide with high value when implemented but the implementation might need the inclusion of several entities within the Volvo Group.

Left Out

This category includes gaps which were found to be far too hard to implement. These gaps can be found in different dimensions and are related to difficulty in coordinating across the Volvo Group. The organisational structure implies that cross-functionality and collaboration becomes difficult to achieve. During the workshops these gaps were said to be very hard to fill. For example, KPI alignment cross-functionally from the dimension Measurements is hard to achieve due to the size and complexity of the organisation within the Volvo Group. Further the involvement of suppliers and dealers in S&OP meeting is hard to achieve due to the very large supplier base and dealer network. Gaps up to stage 5 maturity have mostly been left out due to the fact that this is beyond the gaps up to stage 4, which is the stage Volvo LS need to achieve first before moving their focus to stage 5 maturity. Some gaps from stage 5 were though considered viable, for example employees and management continuously striving for improvement in their S&OP process.

6

Recommendations

With the preceding analysis in mind and for fulfilling the aim with a more practical standpoint, the concluding recommendations for Volvo is summarised and made available in a managerial implications manner.

6.1 Implementation

As previously proclaimed the task of actually implementing and executing any process improvements lies in the hand of the process owner and manager, though this thesis project aspires on acting as a decision support for that task. Hence chosen gaps are further elaborated on and accompanied with suggestive solutions that get presented for Volvo in an attempt to raise awareness of possible benefits of implementing the improvements.

Implementation as concluded in literature can be considered rather difficult, as implied by Lapide (2005b), who also suggests that one of the reasons is that S&OP implementation and change of the S&OP process demands change, not just of the business process but the whole corporate culture. With departmentalisation being one of the biggest obstacles to over-come, as managers from different departments must work collaboratively to achieve common goals of S&OP in a situation where they actually may have conflicting KPIs and incentives. Hence to ensure a successful implementation the incentives and KPI structure needs reviewing, alignment and extensive change management (Lapide 2005b). Radjou et al. (2003) suggest that one efficient way to go is by implementing changes in stages, and through the use of pilots on selected product groups, that can visualise the benefits from the suggested improvement. The selected product group also need to be of big enough strategic importance so that the experienced effect utilise visible financial effect. Lapide (2005b) emphasise that the use of complicated IT resources might be necessary but should be avoided in the first stages of the implementation process. A pilot suggestively should be based upon use of for example spreadsheets and then time can be spent on ensuring that the process gets optimised instead. Once an apparent improvement can be identified, the use of more advanced and automated resources can be utilised.

6.2 Improvement areas

To classify the different gap filling activity alternatives they are sorted into following categories of *Low hanging fruit*, *Mid term opportunities*, *Long term development* and *Other*

improvement opportunities.

6.2.1 Low Hanging Fruit

Measure FCQ on GTS forecasts

The issue with MM not being able to use the forecasts generated by GTS in an efficient way, may have a first stage easy-fix solution. Simply by initiating measuring of forecast quality of these forecasts, MM would know in which extent they actually can take consideration to these numbers. This means logging of previous GTS forecasted sales figures and comparison to the outcome for the same period. Measuring FCQ on GTS forecasts is directly related to the dimension measurements. In this dimension it aims to fill the gap of *Sales measured on FCQ*.

The general cross-functional cooperation between GTS and MM have apparent opportunity for improvement, and if the departments were to work more collaboratively synergies will appear. They could for example work together with developing the sales plan, discussing what factors that will affect the coming period in form of currency changes, commodities market fluctuation etc., and there is likely involvement from other roles and resources at GTS that would benefit S&OP.

GTS to inform MM about marketing initiatives

There is already a decided standard for how information about marketing initiatives should be delivered between the departments of GTS and MM. This standard might need reviewing and reviving, and front and foremost the compliance of using it needs to be monitored and this sub-process needs someone who is accountable for it. One alternative here might therefore be to assign a new task or a new position which can bridge the department gap between GTS and MM, in whose role suggestively would include PIs for both FCQ and compliance with rules for market initiatives informing.

This gap filling activity is connected to the dimension plan integration. Improving in this area would result in gap filling of the gaps *Plans highly integrated* and *New products, life cycles, capacity, risk and promotions get planned and incorporated into the S&OP process*. Both of the gaps decrease but are not completely filled since there are other areas as well that need to be addressed in order to fill the gaps completely.

Measure Forecast Bias

In the roles executed by DIM, Refill and DIP it is included to make decisions about changing forecasts and enter orders manually on judgemental basis. The purpose is to optimise the inventory making it more adapted and dynamic, for example due to reasons not picked up by the system generating automatic forecasts. The intention of the idea is sound, but it also entails the need for these employees being enough experienced to make the right decisions. This way of tampering with forecasts might indeed be very efficient, but as of today Volvo do not measure the quality of their made adjustments, hence they do not really know how much difference they make or if it becomes better or not. The dimension related to this activity is measurements. The gap it aims to fill is *Demand error, customer*

service, total cost.

Checking process compliance

Ensure that the decided standard for the process is actually conducted. By including process compliance measuring in the global template for S&OP one could ensure that everyone works in the same efficient and effective way. The compliance can suggestively be checked through the use of checklists incorporated in the S&OP PowerPoint templates and through making spot-checks at occurring meetings, i.e. someone with good insight in process best practice that is able to identify discrepancies could help respective team to improve and move towards a process standard.

This improvement area affects all dimensions, i.e meetings and collaboration, measurements, organisation, information systems and plan integration. While its main gap lies within the dimension measurements as *S&OP effectiveness* it also touches upon other dimensions. Even though there in some cases might not be gaps present that are affected directly the dimensions might be affected in a way that, for example increases understanding within the dimension organisation or improving meetings generally in the dimension meetings and collaboration. Having a better process compliance will have a positive effect in several ways, with one being that promotions get planned and incorporated due to better compliance which will have an impact on the dimension plan integration. It may not be clear that it affects other dimensions due to the absence of directly related gaps, but the indirect effects can prove to positively affect all dimensions.

Standardise templates and procedure

To ensure that the aggregation of information from the different meetings gets more streamlined, one would need to check so that all regions and brands are using the same standard procedure and template for S&OP. This way both the quality of the consistency and quality of meetings get ensured and that the work of compiling the information gets more straight forward. As of today the quality and maturity of the process seem to vary between brands and regions, hence making sure that the process becomes globally coherent would generate over-all efficiency and comprehension.

This improvement area will affect the dimensions meetings and collaboration, information systems and measurements. A more standard template and procedure should improve the gap *S&OP effectiveness* and with continuous further improvements a good standard can be achieved. It may not affect a gap in information systems but the use of information systems to create templates and to standardise might be affected. By improving in this area the dimension meetings and collaboration can be positively affected since meetings across brands might become more alike and improved as well as collaboration is made easier.

Change process name and clarify process ownership

Changing name of the process from Flow Planning to S&OP would perhaps seem to generate confusion at first, but using international standard nomenclature make the over-all level of comprehension of the process and its objectives etc. higher. Currently ownership of the process is unclear thus it is recommended to state owner, and check so that it is

documented. This area relates to the dimension organisation and with a clear ownership several gaps can be improved. For example, the gaps of *cross functional and empowered attendees*, *continuous improvements* and *understanding of the process* can be elevated and filled with time. Having a process owner can help to elevate the process and start actions to fill more gaps. Further, by changing to the name used in academia the learning and understanding of the process can be improved for new employees and people that aren't involved in the process.

Extend process description with decision meetings

In the meeting process the use of a sort of decision meetings seem to be incorporated in some or all of the regions doing S&OP. Though this is not incorporated in the process description. If the concept of conjuring these decision meetings is viable, the idea of utilising them globally is positive, hence they need to be part of the general process description. This area affects the dimensions meetings and collaboration and organisation. This fills the gap of *executive participation* and in a clear way explains how the process functions and how it is designed. This will include additional meetings to the structure but they are important in order for the continuous improvement process to function well. It is important to show that leaders believe in the process and want to invest to make it a better process.

6.2.2 Mid Term Opportunity

Balanced Scorecard

What perhaps is somewhat disconnected from S&OP and more related to the over-all continuous strategic work at Volvo Aftermarket, is the lack of using the Balanced Scorecard concept. There are apparent benefits with using such or similar for being able to monitor how decisions and initiatives in and related to the S&OP process fall out. With this concept one would both be able to get glimpses of what effect improvements in the S&OP would have, as well as the current well-being of the business as whole. By using Balanced scorecard, the element of strategy incorporated in the S&OP process could be increased.

By using Balanced Scorecard Volvo would likely also be inclined to review the KPI structure for Aftermarket where some issues also have been observed. Some of the departments seem to own KPIs that are more affected by other departments. The strategic focus has shifted from cost reduction to increased service levels, but is this anchored in an idea of profit optimisation, and how is this measured? Is it not about having the right service levels rather than higher service levels, thus rather balancing lost sales cost with inventory cost?

The use of Balance Scorecard would likely influence the S&OP dimensions of Measurements and Organisation. Measurement gaps it would facilitate covering is related to KPI alignment, benchmarking of the S&OP process, and the ability to work more against profitability targets, but also the Organisation dimension gaps relating to executive participation, continuous improvement and understanding of S&OP as profit optimisation tool.

Basic scenario analysis

Making a basic analysis of how demand can change over the time horizon in focus during S&OP and how this may affect operations should be included. There are rarely discussions regarding what is expected to happen and why. Variations will have an effect on inventory, availability and capacity which can be mitigated through basic scenario analysis where risks are identified for the coming periods. Through identification of risks, possible actions can be executed in order to minimize disruptions and capacity can be altered to adapt to proposed actions.

Implementation of Basic scenario analysis would affect gaps both in Measurement dimension as decisions could be evaluated with more consideration to profitability, how decisions would affect KPIs relating to customer service and total cost. There would also likely be effect in the Plan integration dimension as for gaps relating to risk evaluation, available capacity consideration.

Refill order plan

Refill are accountable for a large part of the flow going out from CW Gent and can cause disruptions due to unknown plans. By making plans over the same scope as set in the S&OP process the CW in Gent can prepare for demand variation and lower transportation cost as well as backlog and lost sales. In S&OP meetings Refill present share of air-freight from previous periods and focus on the plan for the coming periods is left out. This kind of communication of plans can indicate to other S&OP team members what to expect and to prepare for the plan.

If Refill's plans were better integrated in S&OP specifically gaps in the Plan Integration dimension would be affected, for example gaps relating to level of plan integration, whether it is a concurrent and collaborative process, and whether plans get constrained in both ways as for the SC stage tier they handle in the RWs.

6.2.3 Long Term Development

S&OP Workbench

The plan Volvo have for the ICT structure, specifically considering the implementation of SAP-SCM, success or not success is rather unclear. SAP can also provide with a workbench-module for S&OP, which might be a viable alternative for Volvo. One step closer to the concept of a S&OP Workbench would be to consolidate the meeting templates from all the different regions and brands. This way data gets better coordinated, and compliance with using standardised templates as previously described would get less complicated. The different S&OP teams could also get inspiration about how to execute the process as well as for which data get presented and so on from other teams' processes, and thus level out the unnecessary differences. This would naturally not be equal with having a full functioning Workbench as described by theory but a step towards it.

The implementation of a S&OP Workbench would have greatest effect on the Information systems dimension obviously, covering gaps relating to plan adjustment and harmonisa-

tion of master data, automatic triggering for unexpected deviations, and prospectively revenue and operation joint optimisation.

Advanced scenario analysis

A more advanced scenario analysis requires a good IT infrastructure where data is consolidated and made easily available. A S&OP workbench is a good consolidator and presenter of data for the process which can be seen as a prerequisite for advanced scenario analysis. When more data is available scenarios can be created with the data set and different business cases can be analysed in order to draw conclusions concerning possible decisions. In this kind of scenario analysis financial figures can be included and the company can optimize towards maximum profit instead of minimum cost or maximum revenue, which on its own might not return the best profit. This kind of scenario analysis can aid the S&OP team towards a more strategic process and focus on a longer time horizon.

Using advanced scenario analysis will affect the dimensions information systems, plan integration and measurements. The previous area, S&OP Workbench, is a prerequisite for this to be built. However, if implemented it will improve gaps such as *revenues and operations optimized jointly* from the dimension information systems, but also the *gap plans highly integrated, seamless integration of plans* and *constraints applied in both directions* from the dimension plan integration. Within the dimension measurements it can improve the gaps *S&OP effectiveness* and *company profitability*.

6.2.4 Other improvement opportunities

EPOS data as input for trend compensation

EPOS data retrieved at dealers are of such good quality that it might be very useful as for acquiring fresh trend data. Even if all the sales for all dealers cannot be aggregated, the use of the data with known quality can be used for setting forecast trend parameters. The concept probably is not complicated to test through a business case made by the TOS team. As this measure does not really relate to any certain dimension the affect on any specific S&OP gap is not apparent, although it highly affect the over-all SC chain efficiency and internal bullwhip effect.

Segment products according to competition sensitiveness

As of today Volvo does not have any segmentation according to competition sensitiveness. The benefit of segmenting according to how much competition a certain product has, would be that lost sales would decrease if inventory for these sensitive products was increased. If the competition sensitiveness is little or none, customers wishing to acquire such product really have no choice but to buy it from Volvo, hence inventory backlogs would not generate as much lost sales. In the case with products in segments with more competition, customers would simply buy from another supplier than Volvo instead, if for example the acquiring of the product is time sensitive, thus generating lost sales for Volvo. This measure doesn't affect any certain gap, though it affects levels of unnecessary inventory keeping and lost sales, optimising stock-keeping.

6.3 Result of Suggested Implementations

To illustrate the effect of suggested implementations, the maturity of Volvo's S&OP was updated as if implementations in Low hanging fruit and Mid term opportunities had been executed. In appendix 1, first the current as-is maturity is presented, as previously in the analysis, which then is directly followed by the updated table with executed implementations in Low hanging fruit and Mid term opportunities. The values are calculated the same way as for Figure 5.6, as explained in Appendix 1, A.2. Figure 6.1 illustrate the effect of the implementations, old values represented in red numbers and lines, new values represented by the blue line. Yellow arrows indicate the change.

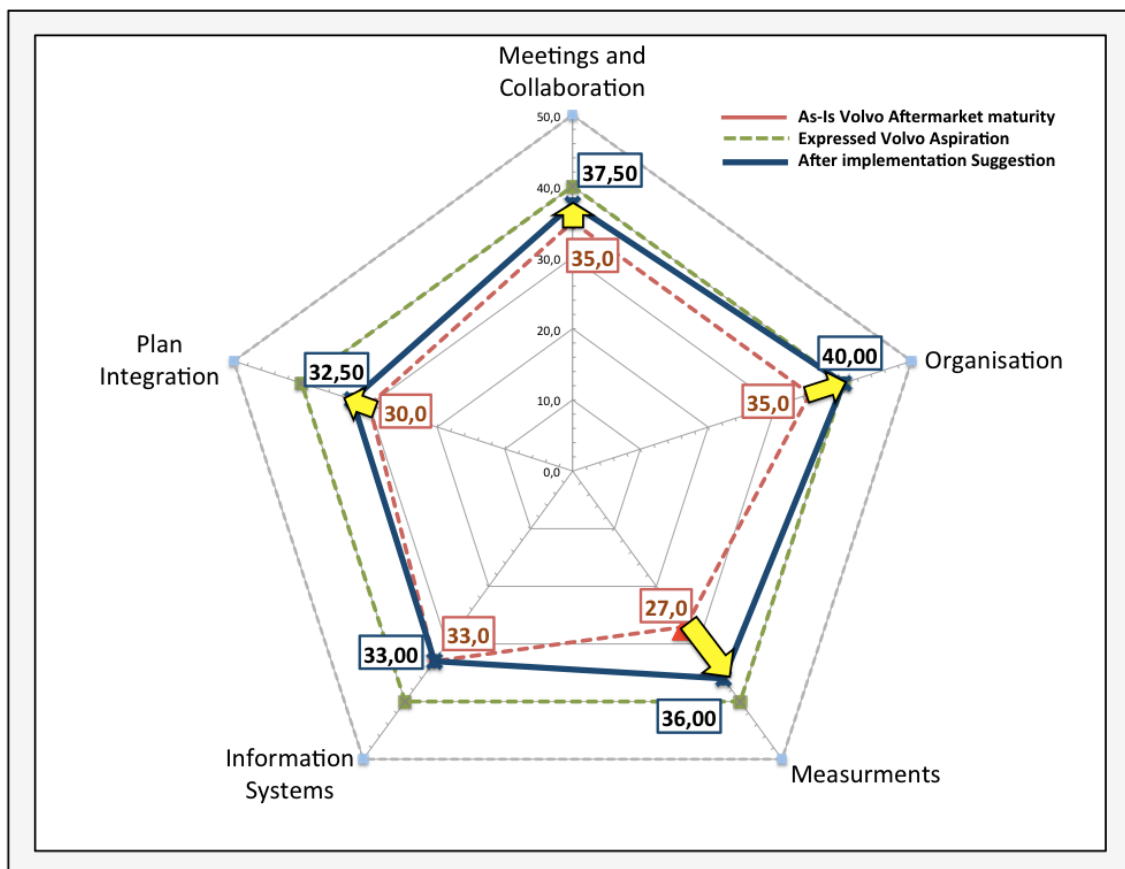


Figure 6.1: Maturity evaluation radar summary after implementation of Low hanging fruit and Mid term opportunities

To make some concluding comments there would be most substantial relative improvements made in the measurement dimension, which would proceed from 27 score to 36. Also noteworthy is that the total maturity of the Organisation dimension would reach advanced level as according to the framework. The Information systems dimension remains unchanged, because there were no suggested improvements other than in the Long term opportunities, which were excluded from this evaluation. The total average maturity would thus advance from 32 to 35.8 by implementing Low hanging fruit and Mid term opportunities as discussed in this chapter.

6. Recommendations

7

Conclusion

The conclusive comments about the result of the thesis in form of research questions, managerial implications, methods and suggestions for further research are presented below.

7.1 Project Intention

The aim of the thesis was to provide Volvo with a structured way of identifying process improvements of Sales and Operations Planning. One of the deliveries intended for Volvo was hence a shortlist of suggested improvement initiatives. The theoretical framework in itself also provides with deeper knowledge about what is considered as more advanced sales and operations planning, and how to execute an efficient and successful process. The actual implementation is outside the stated scope and is a responsibility of Volvo.

7.2 Research Question Perspective

A post-project perspective discussion about the stated research questions. Each research question gets discussed as well as the procedure for answering it, validity and perceived success.

7.2.1 How can S&OP practice maturity be assessed?

To assess the S&OP process, a theoretical framework treating parameters, process steps and a framework of S&OP dimensions and maturity stages was developed. The idea was that this summary with a holistic stance of industry practice of S&OP, would facilitate the improvement process and provide Volvo with an extensive theoretical summary of S&OP as concept. The analogue characteristics of S&OP as a process and what can be concluded as theoretically advanced, makes the framework somewhat a product of the writers effort of finding material and what is decided to be included.

7.2.2 How is Volvo's S&OP process designed?

By constructing the theoretical framework previous to executing the data collection, this procedure became rather efficient. The answers desired in interviews and other data collection had a clear specified intention related to the theoretical framework and maturity assessment. The result of the data collection is then presented in the same section construct as the theoretical framework, i.e. S&OP parameters, process design and the dimensions

of the maturity framework. The level of contextual fit were not an apparent problem as the right answers were acquired with the right questions. To make the analysis more comprehensible the contextual description is extended as for business areas that S&OP is interfacing with and context elements specific for Volvo Group and Volvo Aftermarket enhancing the thesis' scientific uniqueness.

7.2.3 What performance gaps in Volvo's processes can be identified using synthesised maturity framework?

By mapping Volvo against the synthesised theoretical framework, gaps or rather opportunities for advancing are identified. The analysis-process stage wise compared variables and elements of S&OP parameters, process and maturity of S&OP dimensions with collected empiric data to discover independent gaps. The high level of match between collected data and created theoretical framework made the process very streamlined.

Each section of the dimensional maturity assessment is then summarised in a radar diagram that illustrates Volvo's S&OP maturity. In the diagram one can identify that the As-Is maturity for the dimension measurement is actually under a standard maturity S&OP process as according to the stated framework, hence for which more effort were allocated for improvement. The over-all maturity of Volvo Aftermarkets current process (value avg. 32) can though be concluded to be over standard maturity (value avg. 30).

7.2.4 How can Volvo improve their current S&OP?

The list of independent gaps non-surprisingly became very long, hence the need of being able to prioritise between these arose. The transition from theory to practice is of course not as straight forward as one could be inclined to think. This part of the project process was thus handled by consulting those involved in the process, and accordingly a selection of gaps by the authors deemed to be realistically filled, was summarised in a shortlist presented to these participators. Then the list was shortened and refined as a proposition for change, later implemented by Volvo as by them seen fit. The change process itself lay outside the scope of this thesis.

As for what is to be implemented, the recommendations list gets presented for people involved in the process, who are able to implement them either on their own initiatives or suggest them as *commissions* which is a system designed to select and conduct changes, improvements and innovation at Volvo.

The changes were presented according to how viable the implementation is deemed, in collaboration with process participators, to be in four different levels as depicted below. Remaining gaps not chosen to be filled got sorted into a separate *Left out* category.

Low hanging fruit

- Measure FCQ on GTS forecasts
- GTS to inform MM about marketing initiatives
- Measure forecast bias

- Checking process compliance
- Standardise templates and procedure
- Change process name and clarify ownership
- Extend process description with decision meetings

Mid term opportunities

- Balanced Scorecard
- Basic scenario analysis
- Refill order plan

Long term development

- S&OP Workbench
- Advanced scenario analysis

Other improvement areas

- EPOS data as input for trend compensation
- Segment products according to competition sensitiveness

When analysing the prospective effect of implemented improvement measures in the Low hanging fruit and Mid term opportunities category, an updated maturity framework indicates an increase in average maturity (from avg. 32 to avg. 35.8) with largest increase in process maturity of the Measurement dimension which currently is of relative lowest maturity of the five dimensions (27 current, 36 after recommendations).

7.3 Validity and Methods

The vast majority of the data retrieved derive from observations and structured respectively non-structured interviews. The fact that a lot of observational data could be retrieved just by being present at the department executing part of the process, and the opportunity for continuously being able get questions answered directly at site, also aided in making data collection effective and efficient. As the thesis is conjured by two, rather than one author, data have been collected with four ears instead of two, the validity increase.

The intention for this project was to create a framework for S&OP process maturity, but the phrasing of "best practice" have intentionally been excluded in greatest extent, this is due to the fact that what really is "*Best*" practice is really rather unknown. What is really best practice for one company might in the most extreme case be worst case for another. Hence the provided framework is intended to be utilised as guidance for identifying opportunities for process improvements, rather than strict guidelines.

7.4 Future Research

If Volvo wishes to continuously improve their S&OP maturity and discover new opportunities for advancement, they could utilise the developed maturity framework in this thesis as a tool for benchmarking. Close in mind lies Volvo GTO's manufacturing side who execute their process independently from Volvo Aftermarket. Benchmarking in this case

would likely yield benefit for both parties, as discrepancies discovered at respective entity could be conjointly filled in collaboration.

The rapid development in the field of ICT tools also probably renders opportunity for further research. In this thesis the focus has rather been to provide with Volvo a more general view of the S&OP concept and of their current S&OP process as well as forming more general recommendations in how to conjure and improve their S&OP.

The authors suggestion as for the near future of the S&OP at Volvo Aftermarket, is to consider the list of recommendations, suggestively during an extension of a S&OP meeting as for deciding on what to proceed with implementing. Some of the recommendations is easier to implement and can probably be executed within the frames of the day to day operational business, and some needs to be made into commissions for improvements to be executed as projects. For example measuring the quality of the sales forecast can be easily implemented. For other recommendations business cases can be made in order to make prioritization and see the possible effect. The S&OP module that SAP offer is also suggested for further investigation, as the SAP implementation proceeds, this option may become very viable. It is also possible for Volvo Aftermarket to continuously assess their S&OP maturity and when mature enough start looking into the next maturity level.

It is also apparent that Volvo Aftermarket need to review their over-all strategy, as of now they do not use any strategic balancing tools, and the balance scorecard as suggested recommendations might be a good solution as for working with strategy in a more structured way. There is also reason to believe that such structuring would affect and align the set of KPIs used for the aftermarket, which as of now seem to be making some departments work against each other as well as towards targets not focused on over all company profit. In this thesis S&OP performance measurement is also briefly elaborated on in section 2.6 where several suggestions of S&OP goals is presented (figure 2.10). Volvo Aftermarket could use a chosen set of these goals to make the aim of S&OP clearer and more aligned with their strategy.

7.5 Generalisation

The method used when conducting this thesis can be used in other cases as well. The case of Volvo Aftermarket was mapped according to the theoretical framework and later analysed to find gaps between theory and practice. The approach according to the order of the research questions, excluding the first one, can be useful in identifying the maturity level and defining the overall process. While the method can be used, results may vary due to the fact that a new case might have a different S&OP context compared to Volvo's. The context of Volvo Aftermarket had an impact on the gap analysis and what could be done, implying that with another context the end result might have been different. Following the method of this thesis can provide with understanding of how mature the S&OP process is and what can be improved.

While the context of the Volvo Group and Volvo Aftermarket is complex and special in itself, companies that experience similar gaps can still be recommended to close gaps that

7. Conclusion

are important for an improvement in the S&OP process. There are gaps that emphasise the importance of, for example, measuring the process. Filling these gaps can aid in continuously improving and controlling the process, which does not have to be context specific. As this thesis presented recommendations based on gaps for Volvo Aftermarket, they are context specific and there is low transferability to other companies in that regard. Still, the underlying gaps and gap analysis are important for overall progress in the maturity framework. Each company will still have its own context in which priority of filling some gaps can change and implementations become differently structured. Still some gaps that companies similar to Volvo's maturity level should look to fill are measuring sales forecast accuracy, have executive participation, have empowered attendees, a clear process ownership and applying constraint on both demand and supply plans. These are gaps that apart from context specific gaps can have an impact on the process performance and these are gaps that can be aimed to be filled on an initial level by any company on level three maturity.

This thesis does not really delve into the subject of implementation and execution as it is considered outside the scope. But to discuss briefly, out of a general change management perspective, it is obvious in Volvo Aftermarket's case with a such large, global and scattered organisation that to be able to create a really coherent and efficient process it is probably necessary to take a top-down stance with more executive participation to both make the process coherent as well as for being able to make it more strategic than it is today. If only people with tactical and operational targets and mindsets are really involved in the process, the targets achieved will only be tactical and operational. Companies with similar organisational and global structure need to consider these difficulties as well.

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A

Appendix 1

A.1 Calculating maturity index for radar diagram in figure 5.6

Following exemplifies the procedure for calculating the dimension maturities. Illustrated in the maturity summary below, colours indicate fulfilment (green), partial fulfilment (grey) or non-fulfilment (red) of a maturity gap. The values represented for the dimension in figure 5.6, is for the dimension "Organisation" calculated based on the concept that total points for full fulfilment of a dimension stage is 10. As all gaps are green in stage 1 this gives 10 points. The same goes for stage 2, hence totalling 20 so far. At stage 3, there are 4 gaps in total that can be filled, therefore each gap comprises of $10/4$ points each. As 3 out of 4 gaps are filled this gives total of 7.5 points. Stage 4 maturity, also contain four gaps, where in the colours indicate that one is fulfilled, and three are partially filled. This means we have 2.5 points for the fulfilled gap, and 3 times half of 2.5, comprising total 6.25 points for that stage. Stage 5 also consist of 4 gaps, one being partially filled and the rest non-fulfilled, hence giving half of 2.5 points in total for that stage. Total score for the Organisation dimension is hence $10 + 10 + 7.5 + 6.25 + 1.25 = 35$.

A.2 Maturity Evaluation Dimensions

Follows does a summary of the maturity evaluation. For each dimension both the as-is situation is presented subsequently followed by the maturity after implementation of Low hanging fruit, and Mid term opportunities implementations. Light green and light grey areas indicate that the gap status have been changed due to the suggested improvements.

Meetings and Collaboration

Stage	Grimson & Pyke	Other
1	<ul style="list-style-type: none"> - Silo culture - No meetings - No Collaboration 	
2	<ul style="list-style-type: none"> - Discussed at top level management meetings - Focus on financial goals 	<ul style="list-style-type: none"> - Lapide (2005): Chaotic and sporadic schedule for meetings, that get frequently cancelled. - Lacking effort for preparation of material
3	<ul style="list-style-type: none"> - Staff Pre-meetings - Executive S&OP meetings - Some Supplier/Customer data 	<ul style="list-style-type: none"> - Lapide (2005): Increased meeting frequency
4	<ul style="list-style-type: none"> - Supplier & Customer Data incorporated - Suppliers & Customers participates in parts of meetings 	
5	<ul style="list-style-type: none"> - Event driven meetings supersede scheduled meetings - Real time access to external data 	<ul style="list-style-type: none"> - Lapide (2005): Keep meetings at a minimum and let S&OP Workbench initiate event-driven meetings when necessary.

Figure A.1: Meetings and Collaboration Maturity Evaluation

Meetings and Collaboration

Stage	Grimson & Pyke	Other
1	<ul style="list-style-type: none"> - Silo culture - No meetings - No Collaboration 	
2	<ul style="list-style-type: none"> - Discussed at top level management meetings - Focus on financial goals 	<ul style="list-style-type: none"> - Lapide (2005): Chaotic and sporadic schedule for meetings, that get frequently cancelled. - Lacking effort for preparation of material
3	<ul style="list-style-type: none"> - Staff Pre-meetings - Executive S&OP meetings - Some Supplier/Customer data 	<ul style="list-style-type: none"> - Lapide (2005): Increased meeting frequency
4	<ul style="list-style-type: none"> - Supplier & Customer Data incorporated - Suppliers & Customers participates in parts of meetings 	
5	<ul style="list-style-type: none"> - Event driven meetings supersede scheduled meetings - Real time access to external data 	<ul style="list-style-type: none"> - Lapide (2005): Keep meetings at a minimum and let S&OP Workbench initiate event-driven meetings when necessary.

Figure A.2: Meetings and Collaboration Maturity Evaluation - After implementation of improvement measures

A. Appendix 1

Organisation

Stage	Grimson & Pyke	Other
1	- No S&OP organisation	- Wagner et al. (2014): Lack of Know-How
2	- No formal S&OP organisation	- Wagner et al. (2014): S\&OP affiliates are yet not empowered to make any affecting decisions.
	- Components of S&OP in other positions	- Roles are not clearly defined. - People are not held accountable for plans and performance, lack of ownership. - Little to no executive support - Low knowledge about the process and how to execute.
3	- Formal S&OP is part of other position: Product manager, Supply manager, but there is not a dedicated team.	- Wagner et al. (2014): Typically empowered attendees. - Partially accountable participators. - Clear S&OP-process owner.
4	- Formal S&OP team	- Lapide (2005): Cross-functional and empowered attendees.
	- Executive participation	- Wagner et al. (2014): Sufficient Know-How to execute advanced S\&OP and additional activities like Risk management
5	- Throughout the organisation S&OP is understood as a tool for optimizing company profit	- Lapide (2005): High level of supply chain integration, whereas collaborative input is automatically drawn from customers and suppliers detecting imbalances
		- Wagner et al. (2014): Top management commitment both internally and from SC-partners. - Employees and management continuously strive for improvement

Figure A.3: Organisation Maturity Evaluation

Stage	Grimson & Pyke	Other
1	- No S&OP organisation	- Wagner et al. (2014): Lack of Know-How
2	- No formal S&OP organisation	- Wagner et al. (2014): S\&OP affiliates are yet not empowered to make any affecting decisions.
	- Components of S&OP in other positions	- Roles are not clearly defined. - People are not held accountable for plans and performance, lack of ownership. - Little to no executive support - Low knowledge about the process and how to execute.
3	- Formal S&OP is part of other position: Product manager, Supply manager, but there is not a dedicated team.	- Wagner et al. (2014): Typically empowered attendees. - Partially accountable participators. - Clear S&OP-process owner.
4	- Formal S&OP team	- Lapide (2005): Cross-functional and empowered attendees.
	- Executive participation	- Wagner et al. (2014): Sufficient Know-How to execute advanced S\&OP and additional activities like Risk management
5	- Throughout the organisation S&OP is understood as a tool for optimizing company profit	- Lapide (2005): High level of supply chain integration, whereas collaborative input is automatically drawn from customers and suppliers detecting imbalances
		- Wagner et al. (2014): Top management commitment both internally and from SC-partners. - Employees and management continuously strive for improvement

Figure A.4: Organisation Maturity Evaluation - After implementation of improvement measures

A. Appendix 1

Measurements

Stage	Grimson & Pyke	Other
1	- No measurement	
2	- Measure how well operations meets the sales - Asymmetric information flow between sales and operations. Operations are limited to adapt.	- AMR Research (2009): Order fill rate, inventory levels, asset utilisation - Wagner et al. (2014): Non-aligned Basic KPIs that are sporadically measured.
3	- Sales measured on forecast accuracy	- AMR Research (2009): Order fill rate, forecast error, inventory turnover rate - Wagner et al. (2014): Partially aligned KPIs, that are measured regularly, with some incentives that are related. - Inconsistent S&OP efficiency measuring
4	- New product introduction - S&OP Effectiveness	- AMR Research (2009): Demand error, customer service, working capital, total costs - Wagner et al. (2014): Full alignment of KPIs cross-functionally and bonuses that are related. KPIs for S&OP efficiency. - Irregular internal S&OP benchmarking.
5	- Company profitability	- AMR Research (2009): Demand risk, customer service, cash flow, market share, profit - Wagner et al. (2014): KPIs that also accounts for SC-efficiency and efficiency of SC-partner tiers. - Regular Internal and external S&OP benchmarking.

Figure A.5: Measurement Maturity Evaluation

Stage	Grimson & Pyke	Other
1	- No measurement	
2	- Measure how well operations meets the sales - Asymmetric information flow between sales and operations. Operations are limited to adapt.	- AMR Research (2009): Order fill rate, inventory levels, asset utilisation - Wagner et al. (2014): Non-aligned Basic KPIs that are sporadically measured.
3	- Sales measured on forecast accuracy	- AMR Research (2009): Order fill rate, forecast error, inventory turnover rate - Wagner et al. (2014): Partially aligned KPIs, that are measured regularly, with some incentives that are related. - Inconsistent S&OP efficiency measuring
4	- New product introduction - S&OP Effectiveness	- AMR Research (2009): Demand error, customer service, working capital, total costs - Wagner et al. (2014): Full alignment of KPIs cross-functionally and bonuses that are related. KPIs for S&OP efficiency. - Irregular internal S&OP benchmarking.
5	- Company profitability	- AMR Research (2009): Demand risk, customer service, cash flow, market share, profit - Wagner et al. (2014): KPIs that also accounts for SC-efficiency and efficiency of SC-partner tiers. - Regular Internal and external S&OP benchmarking.

Figure A.6: Measurement Maturity Evaluation - After implementation of improvement measures

Information Systems

Stage	Grimson & Pyke	Other
1	<ul style="list-style-type: none"> - Individual managers keep own spreadsheets - No consolidation of information 	
2	<ul style="list-style-type: none"> - Many spreadsheets - Some consolidation but done manually 	
3	<ul style="list-style-type: none"> - Centralised information - Revenue or operations planning software 	<ul style="list-style-type: none"> - Lapide (2005): Collaborative information from important customers or suppliers presented at meetings - Sales' software connected with operations' though not concurrently optimised - Wagner et al. (2014): Inconsistent and manually entered data from other systems, which is not entirely harmonised throughout the organisation.
4	<ul style="list-style-type: none"> - Batch process - Revenue & operations optimization software - link to ERP but not jointly optimised - S&OP workbench 	<ul style="list-style-type: none"> - Wagner et al. (2014): Automatic plan adjustments. Harmonised Master data throughout the organisation. - System triggers automatic alerts in case of unexpected deviations
5	<ul style="list-style-type: none"> - Integrated S&OP optimisation software - Full interface with ERP, accounting, forecasting - Real time solver 	<ul style="list-style-type: none"> - Wagner et al. (2014): Supply chain partners integrated in system. All relevant data available(incl third party capacity data) - IT-systems completely aligned throughout the SC.

Figure A.7: Information Systems Maturity Evaluation

Stage	Grimson & Pyke	Other
1	<ul style="list-style-type: none"> - Individual managers keep own spreadsheets - No consolidation of information 	
2	<ul style="list-style-type: none"> - Many spreadsheets - Some consolidation but done manually 	
3	<ul style="list-style-type: none"> - Centralised information - Revenue or operations planning software 	<ul style="list-style-type: none"> - Lapide (2005): Collaborative information from important customers or suppliers presented at meetings - Sales' software connected with operations' though not concurrently optimised - Wagner et al. (2014): Inconsistent and manually entered data from other systems, which is not entirely harmonised throughout the organisation.
4	<ul style="list-style-type: none"> - Batch process - Revenue & operations optimization software - link to ERP but not jointly optimised - S&OP workbench 	<ul style="list-style-type: none"> - Wagner et al. (2014): Automatic plan adjustments. Harmonised Master data throughout the organisation. - System triggers automatic alerts in case of unexpected deviations
5	<ul style="list-style-type: none"> - Integrated S&OP optimisation software - Full interface with ERP, accounting, forecasting - Real time solver 	<ul style="list-style-type: none"> - Wagner et al. (2014): Supply chain partners integrated in system. All relevant data available(incl third party capacity data) - IT-systems completely aligned throughout the SC.

Figure A.8: Information Systems Maturity Evaluation - After implementation of improvement measures

A. Appendix 1

Plan Integration

Stage	Grimson & Pyke	Other
1	<ul style="list-style-type: none"> - No formal planning - Operations attempts to meet incoming orders 	
2	<ul style="list-style-type: none"> - Sales plan drives operations - Top-down processes - Capacity utilization dynamics ignored 	<ul style="list-style-type: none"> - Wagner et al. (2014): new products, life cycles, capacities, price changes, risk management, and promotions get planned, but not incorporated in the S\&OP. - Only a few SKUs/product families are considered.
3	<ul style="list-style-type: none"> - Sequential process in one direction only - Bottom-up plans, tampered by business goals - Some plan integration 	<ul style="list-style-type: none"> - Wagner et al. (2014): new products, life cycles, capacities, price changes, risk management, and promotions get planned, partially and insufficiently incorporated in the S\&OP. - Most SKUs/product families considered.
4	<ul style="list-style-type: none"> - Plans highly integrated - Concurrent and collaborative process - Constraints applied in both directions 	<ul style="list-style-type: none"> - Wagner et al. (2014): new products, life cycles, capacities, price changes, risk management, and promotions get planned, and sufficiently incorporated in the internal S\&OP process.
5	<ul style="list-style-type: none"> - Seamless integration of plans - Process focuses on profit optimization for whole company 	<ul style="list-style-type: none"> - Wagner et al. (2014): new products, life cycles, capacities, price changes, risk management, and promotions get planned, and completely incorporated in the full S\&OP process. - SC-partners integrated in the S\&OP alignment process.

Figure A.9: Plan Integration Maturity Evaluation

Plan Integration		
Stage	Grimson & Pyke	Other
1	<ul style="list-style-type: none"> - No formal planning - Operations attempts to meet incoming orders 	
2	<ul style="list-style-type: none"> - Sales plan drives operations - Top-down processes - Capacity utilization dynamics ignored 	<ul style="list-style-type: none"> - Wagner et al. (2014): new products, life cycles, capacities, price changes, risk management, and promotions get planned, but not incorporated in the S\&OP. - Only a few SKUs/product families are considered.
3	<ul style="list-style-type: none"> - Sequential process in one direction only - Bottom-up plans, tampered by business goals - Some plan integration 	<ul style="list-style-type: none"> - Wagner et al. (2014): new products, life cycles, capacities, price changes, risk management, and promotions get planned, partially and insufficiently incorporated in the S\&OP. - Most SKUs/product families considered.
4	<ul style="list-style-type: none"> - Plans highly integrated - Concurrent and collaborative process - Constraints applied in both directions 	<ul style="list-style-type: none"> - Wagner et al. (2014): new products, life cycles, capacities, price changes, risk management, and promotions get planned, and sufficiently incorporated in the internal S\&OP process.
5	<ul style="list-style-type: none"> - Seamless integration of plans - Process focuses on profit optimization for whole company 	<ul style="list-style-type: none"> - Wagner et al. (2014): new products, life cycles, capacities, price changes, risk management, and promotions get planned, and completely incorporated in the full S\&OP process. - SC-partners integrated in the S\&OP alignment process.

Figure A.10: Plan Integration Maturity Evaluation - After implementation of improvement measures

A.3 Questions from Interview Templates

- What is your role in the S&OP-process?
- How do you think it is working now?
- Why do you do the S&OP process?
- Do you feel the process have clearly stated goals?
- Do you believe the Goals of S&OP/Flow planning meetings are aligned with the business plan?
- What would you like to improve?
- What is the aim of the S&OP process?
- Who is process owner?
- Is S&OP process performance measured?
- What does the decision process look like?
- Are there any other parallel information flows to Flow planning meetings that are included in the decision process?
- Who decides which KPIs to use?
- Are goals aligned between departments?
- What IT is used for the process today?
- How do Volvo aspire on developing the process in the future?
- Should finance be more involved in the process?
- TOS does different scenario analyses today?
- Connected vehicles and their data?
- Better information from dealers?
- Dealers use the same system?
- Incentives for Flow planning participants?
- Anything else you want to add about Flow planning?
- Who participates at Dealer facing Flow planning, and what do they do?
- What is the aim with Dealer facing Flow planning?
- Do all meetings look the same, is the execution consequent?
- Who owns the process?
- How is information aggregated?
- What is DIM's/Refill's/DIP's/Material-Planning's input for Flow planning?
- What is DIM's/Refill's/DIP's/Material-Planning's output from Flow planning?
- Can Flow planning be considered tactical or strategical?
- What KPIs do the department use?