FORECASTING MANAGEMENT

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Abstract

In a world that is moving faster and faster, a company’s ability to align to market changes is becoming a major competitive factor. Forecasting enables companies to predict what lies ahead, e.g. trend shifts or market turns, and makes it possible to plan for it. But looking into the future is never an easy task.

“Prediction is very difficult, especially if it’s about the future.” (Niels Bohr, 1885-1962)

However, progress in the field of forecasting has shown that it is possible for companies to improve on forecasting practices. This master thesis looks at the sales forecasting practices in MNCs primarily operating in emerging and developing countries. We examine the whole process of sales forecasting, also known as forecasting management, in order to develop a comprehensive model for forecasting in this type of companies. The research is based on a single case study, which is then later generalized into broader conclusions.

The conclusion of this master thesis is that forecasting is a four-step exercise. The four stages we have identified are: Knowledge creation, knowledge transformation, knowledge use and feedback. In the course of these four stages a company’s sales forecast is developed, changed and used. By understanding how each stage works and what to focus on, companies will be able to improve their forecasting practices.

Key Words: Sales Forecasting, Sales Forecasting Process, Forecasting Management, Forecasting Methods, Performance Measurement, Domain Knowledge, Forecasting Systems, Emerging and Developing Country Markets, Construction Equipment, VCE Region International, Volvo
Acknowledgements

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Also, we would like to thank our case company Volvo Construction Equipment Region International and its management for making this research possible. In particular, we would like to thank Anders Sjögren who provided us with excellent supervision from the initial kick-off meeting in Eskilstuna until the final hand-in of this master thesis. We would also like to thank all participating respondents at VCE Region International for taking their time to give us valuable inputs and information for this study.

Finally, we would like to thank our families and friends for their encouragement during the last five months, as well as their patience and great support.

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Spring 2009

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Carina Kellner
About the Authors

Andreas and Carina are both studying in Sweden at Baltic Business School, University of Kalmar, completing the master degree program: Growth through Innovation and International Marketing. In the course of our studies at BBS, we accomplished several assignments for Volvo Construction Equipment with great results. When the opportunity to write a Master Thesis for Volvo Construction Equipment occurred, we were immediately interested. We are thankful for this opportunity and put our best effort into achieving a good thesis – and we can honestly declare that we are proud of the result!

Andreas Jessen was born in May 1985 and grew up in Odense, Denmark. After finishing his engineering degree in business development at Århus University – Herning Institute of Business Administration and Technology, Andreas started on a Master of Technology Based Business Development. In the course of this master he went a year to Kalmar to study his second master. Andreas has not worked with sales forecasting previously but has experience in technology forecasting, which do have some similarities. His motivation for this thesis lies in the opportunity to work with a company such as Volvo Construction Equipment, and to get real life experience in working with a subject of great interest to him.

Carina Kellner was born in November 1985 and grew up in Tulln, Austria. She graduated with a Bachelor of Business Administration degree majoring in Business Administration and E-Business Management from IMC FH Krems, University of Applied Science, Austria in 2008. In the course of her Bachelor studies, she spent half a year as an exchange student in Helsinki/Finland, as well as completed an internship in Vancouver/Canada for half a year. Her motivation for this thesis lies within her natural passion for market research, and her marketing-, management- and project planning background in her Bachelor’s degree. Her interest has been in applying this knowledge in the real business world. She would like to further develop her career in business consulting and international marketing.

This thesis concludes their studies for a Master of Science in Growth through Innovation and International Marketing at Baltic Business School, University of Kalmar, Sweden.
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>4C</td>
<td>New VCE Forecasting system and Process, “Foresee”</td>
</tr>
<tr>
<td>Act</td>
<td>Actuals, i.e. units sold</td>
</tr>
<tr>
<td>AH</td>
<td>Articulated Haulers</td>
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<tr>
<td>ASM</td>
<td>Area Sales Manager</td>
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<tr>
<td>BC</td>
<td>Regional Business Coordinator</td>
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<tr>
<td>CCC</td>
<td>Communication, Cooperation, and Collaboration</td>
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<tr>
<td>DBM</td>
<td>Dealer Business Meeting</td>
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<tr>
<td>EtA</td>
<td>Expected date of arrival to destination port</td>
</tr>
<tr>
<td>EtD</td>
<td>Expected date of delivery from port</td>
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<tr>
<td>EWI-Report</td>
<td>Early Warning Indicator Report</td>
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<tr>
<td>F0x</td>
<td>Forecast month x</td>
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<tr>
<td>Fc</td>
<td><strong>Forecast</strong> - When talking about forecast, we mean sales forecasting, not to mix up with other types of forecasting, e.g. technology forecasting.</td>
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<tr>
<td>HQ</td>
<td>Head Quarter</td>
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<tr>
<td>IOA</td>
<td>Islands of analysis</td>
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<td>KPI</td>
<td>Key Performance Indicator</td>
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<tr>
<td>MAPE</td>
<td>Mean Absolute Percentage Error</td>
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<tr>
<td>MAS</td>
<td>Machine Administration System, for machine ordering &amp; reporting</td>
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<td>MNC</td>
<td>Multinational Company</td>
</tr>
<tr>
<td>MOM</td>
<td>Master Order Management, Order System</td>
</tr>
<tr>
<td>OOH</td>
<td>Orders On Hand</td>
</tr>
<tr>
<td>R12 F0x</td>
<td>Rolling 12 months forecast from month x</td>
</tr>
<tr>
<td>RBF</td>
<td>Rule Based Forecasting</td>
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<tr>
<td>ROH</td>
<td>Retails on Hand, i.e. all end-customer orders known by Dealer (also referred to as Orders on Hand or Order Backlog)</td>
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<tr>
<td>S&amp;OP</td>
<td>Sales and Operations Planning</td>
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<td>S&amp;OP Leader</td>
<td>Responsible person for a product group</td>
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<td>SAP</td>
<td>Systems, Applications, and Products in Data Processing</td>
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<td>TM</td>
<td>Total Market</td>
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<tr>
<td>TOD</td>
<td>Target for Operational Development</td>
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<tr>
<td>VCE</td>
<td>Volvo Construction Equipment</td>
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<tr>
<td>VDN</td>
<td>Volvo Dealer Network</td>
</tr>
<tr>
<td>VFO</td>
<td>Volvo Front Office</td>
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<tr>
<td>VP</td>
<td>Vice President for each sub-region</td>
</tr>
<tr>
<td>VP Sales</td>
<td>Vice President of Sales Region International</td>
</tr>
<tr>
<td>VPT</td>
<td>Volume Planning Team</td>
</tr>
<tr>
<td>YTD</td>
<td>Year-to-Date</td>
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This introduction chapter begins with presenting the subject background in order to familiarize the reader with the thesis’ topic. This is followed by an introduction of the case company leading to the research problem. Moreover the introduction chapter includes the problem definition, which is indicating the main strategic question as well as the four research questions. After that we describe the purpose, delimitations and contributions of the thesis. Finally we provide the reader with an outline of the entire thesis and illustrate the pursued time plan of our research.
1 Introduction

1.1 Background

Because forecasting has been so important for so many years in business life, the theoretical body of work is large. However, the context in which forecasting operates has changed substantially throughout the last decade. In the great days of planning, represented by the fifties and sixties, forecasting was an “easy” task. Demand was stable and few new products were launched which made it easier to predict market share and total market growth. At that time forecasting was more a statistical effort using time-series from past sales to create predictions about the future. However, the planning era is dead and gone, represented by a globalized market, shorter product life cycles, higher degree of innovation etc.

Today, it is not as simple to forecast as it used to be. Hence, forecasting is much more complex than “just” a statistical analysis of previous sales data. Especially companies that operate on a global level, experience the positive sides but also the drawbacks of the globalization of world markets. For Multinational Companies (MNCs) to have effective forecasting, they must encompass both statistical forecasting and judgmental forecasting. This need represents a lot of difficulties, and does not only concern the way the forecast is created but also how it is used. One of the biggest challenges is that forecasting has changed from a top-down operation to be more reliant on bottom-up forecast. This is because the knowledge that is not visible in the historical sales is only available to the employees closest to the market. This change brings in a lot of new disciplines in forecasting such as - training, performance measurement, knowledge sharing, collaboration, functional integration and many more. This thesis aims to look at exactly these new disciplines in order to create a model for forecasting in MNCs on the global market.

1.2 The Case Company

This thesis is initiated by Volvo Construction Equipment (VCE) and is done in close cooperation with Region International. VCE Region International is part of the Volvo Group, one of the world’s leading suppliers for transportation solutions. Figure 1 provides an overview of the Groups’ total business areas and business units.
VCE is one of the world leaders within the construction equipment industry. Today, VCE has more than 16,000 employees worldwide. The company is manufacturing both heavy and compact construction equipment used in road construction, general construction as well as forestry and mining industries. With an annual turnover of approximately USD 5.5 billion with profits of about USD 500 million, VCE represents the second biggest business area in the overall Volvo Group, only surpassed by Volvo Trucks. VCE’s products and services are available in more than 125 markets around the world, divided into several business lines, i.e. haulers and loaders, excavators, road machinery, compact equipment and Lingong (VCE Region International: Company Presentation 2009).

VCE is divided into four regions, i.e. Region Asia, Region Europe, Region International, and Region North America. For this thesis we are focusing on Region International which consist of 12 offices with Volvo employees, 68 independent dealer partners and three Volvo-owned dealers serving approximately 100 countries within Region International (VCE Region International: Company Presentation 2009). The Headquarter of VCE Region International is located in Eskilstuna, Sweden. Region International is furthermore divided into the following sub-regions: Africa, Latin America, Russia, Ukraine & Belarus, Middle East, Turkey & Central Asia, as well as Oceania.
1.3 Research Problem

For companies to plan ahead, even just a single day, they need to forecast. Such forecasting may concern questions like the following: What technology will dominate our marketplace tomorrow? Should we hire or fire more people? Or how is the demand going to evolve during the next five months?

All these questions are related to forecasting. Making accurate forecasts about the future enables companies to set up the organization for a best fit. VCE Region International is primarily focused on sales forecasting, which means projection of current demand into the future. This is relevant for MNCs that, like the case company, manufacture machines that are very expensive products, and therefore represent a big capital investment if they pile up in a stock or warehouse.

There are different reasons for keeping a stock such as logistic or production reasons. However, in many instances one could say that stock keeping is a buffer for bad forecasting. In a time of increased globalization and competition, companies cannot afford having capital tied up in stocks not making any profit. Therefore, it is more important than ever to look out for improvements in the forecasting procedures. The more accurate a forecast is, the more capital can be given free and can be used elsewhere in the organization. When considering the current financial crisis, freezing up capital represents a substantial competitive edge for any company.

Even though the best forecasting process would probably not have foreseen the global financial crisis that hit during 2008, and the aftershocks of the crisis made it evident how important forecasting is for a company. Companies operating in a global context often have huge capital investments tied up in stocks and inventories and if a company fails to predict the demand in the future this capital could represent a big risk for the company. Failing to restructure a company for changes in the future demand can even result in bankruptcy.

The forecasting process of a global MNC is quite complex as it often involves a large number of people crossing geographical and departmental boundaries. Research into theory reveals that forecasting practices can be considerably affected by a company’s management, i.e. identifying critical information needs at certain planning stages and the initial information provider.

The consistent theme in this thesis is to examine an MNC’s forecasting process, with a focus on forecasting management. Moreover, we investigate the information requirements for
developing forecasts for an effective and efficient production and inventory. We will focus on forecasting intelligence, the input, i.e. information and data, from the market to the company. We also want to investigate how the MNC creates its forecasts, identify each contributor in the forecasting process and the value this person provides to the final forecast. Therefore, it is important to verify the information-need in the different functions, especially with regards to the different time frames for production. Furthermore we want to allocate the origin of qualitative information or data within the forecasting process, especially resolve if the data is used to its fullest potential. Special attention is given to the individuals’ perception and understanding of forecasting, the valuation of the forecasting process as a whole and its contribution to the final result. Furthermore, we describe the necessity for forecasting management, and the link between forecasting functions, the information need and forecasting users.

1.3.1 Problem Definition

In this section, we present how the main problem, i.e. strategic question, and the research sub-problems have been defined. Having in mind the previously mentioned, as well as considering the aim of this thesis, this is how we state the main strategic question:

**Main Strategic Question**

What can be done to improve the efficiency, accuracy and use of sales forecasting in MNCs’ manufacturing capital investment goods?

With the launch of forecasting systems, MNCs’ take a step towards a more systemized and transparent way to organize their forecasting, especially in the midst of this crisis. IT systems make it possible to have a direct connection between the actual forecast contributors and the final production planners. The initial question is how the MNC’s personnel, i.e. the local sales force, compose the forecasting data and this is then used by the production planners. Accuracy and efficiency are the focal points at both stages: when collecting and utilizing the final forecast. Hence, the main strategic question is based on a forecasting management issue, making it necessary to investigate all involved functions and their contributions.
In order to provide answers and conclusions to the main strategic problem, we identify and investigate four main research areas:

**RESEARCH QUESTION 1**
How does the forecasting process look like, i.e. how the forecasted data flows from markets to production?

The first research question is focusing on mapping out an MNC’s entire network that provides information and data for the forecasting process. The creation of such a map is necessary as it provides information about the applied techniques of forecasting data, and so helps us to get a better understanding of the information flow within the forecasting process. Hence, this question describes the current state of forecasting at the investigated case company, which will be evaluated and analyzed according to relevant theories and logical reasoning.

**RESEARCH QUESTION 2**
What information in the forecast is necessary to maximize the support of production planning?

The second research question will focus on identifying the information needed at the “factory-level”, i.e. for the production planners, in order to plan and execute an efficient production within the three time-frames: short-, mid-, and long-term. This research question considers the following sub-questions:

- How can we align production lead-time with the forecasting?
- How reactive is the production planning to changes in the forecasted demand in different time frames?

**RESEARCH QUESTION 3**
What is the forecasting contributors’ reasoning behind the information added to the forecasting system?

Today, the process of creating the expected sales numbers is an individual procedure behind each sales force. The third research question focuses on this individual procedure, finding out the different grounds behind the specific numbers, e.g. the use of domain��识, experience and macro-economic data. Consequently, we can determine if some information
could be gathered from alternative sources or in a different way. This research question considers the following sub-questions:

- How is the forecasted data generated? Mainly pointing out what domain knowledge and macro-economic data is utilized.
- Is the reasoning behind short-term forecasting different than for mid- or long-term forecasting?
- How does the information originate in the forecasting process with regards to the different time frames? Aiming to identify whether the arguments and reasoning behind the forecast are different within the time frames.

The fourth research question focuses on individual actors’ motivation and commitment to forecasting. We also investigate the individuals’ relative valuation of the forecasting process as a whole and their contribution to the final outcome. As a result potential misfits between these actors will be described and the consequences it has on the indirect relations between them, furthermore we will discuss how their motivation and commitment can be enhanced.

1.4 Purpose of the Thesis

The focus of this research is on sales forecasting practices in MNCs’ that are operating in the construction equipment-, or a similar industry. This is primarily spotlighting on the value contribution of each actor to the whole forecasting process.

The purpose of the thesis is to describe the current forecasting process of an MNC, to determine its weaknesses and strengths, where the main focus is on the forecasted data utilization and its quality in regards of its production and inventory planning. Because forecasting requires a good mix of information that is accurate and timely, we will look at the information base for forecasts. Based on the preliminary research we will identify problem areas and explore how they can be improved. Special attention is paid to the added value each actor provides with forecasted data to the final production and inventory planning. Another focal point is the individual’s awareness of forecasting within the company, i.e. how the different forecasting contributors in the process perceive their contribution to the final outcome and to what degree they are committed to forecasting in general.
We also aim to develop a research model, serving as a strategic analytical tool for evaluating the accuracy and efficiency of information, this will be done by combining several theories and aspects of forecasting. These are: forecasting intelligence, -excellence, and –management. The purpose of this model is to point out certain critical aspects of sales forecasting management that need to be taken into consideration when operating in turbulent and dynamic environments like the construction equipment market.

The thesis will provide several practical suggestions, recommendations and solutions that could improve an MNC’s current forecasting practices, mainly focusing on improvements and corrective actions.

1.5 Delimitations
Due to a rather broad study area available to this research the following delimitations, illustrating the outer borders of our investigation, aim to clarify on which specific areas we will focus and help the reader understand the scope of the research.

- The perspective presented and analyzed in this thesis is that of the MNC.
- The focus of this thesis is on one industry, that is, the construction equipment industry.
- The problem we investigate concerns the MNC’s forecasting process, however, we will only look at the specific contributors within this process and examine the value they add with the contributed information and data. We will not investigate the forecasting IT system neither evaluate the process from a technical or engineering point of view.
- In this thesis forecasting refers to sales forecast; financial forecasts are not included in this study.

1.6 Contributions
Although the literature on sales forecasting is elaborate, we feel that this thesis looks at a certain area that is missing and that is sales forecasting management. The majority of forecasting literature concerns specific methods on statistical or judgmental forecasting. We think that our thesis provides an overall model for forecasting management in an MNC like our case company. At current time the literature that looks at forecasting in general tends to focus on rules of thumb, or fail to differentiate to a specific industry. Therefore, we believe that this thesis is an addition to the literature as it goes more in depth with a specific industry and ultimately suggests a model for forecasting management.
1.7 Outline of the Thesis

This master thesis pursues the following sequence as illustrated below.

Chapter 1 is the initial starting point of this thesis, firstly, providing the reader a general introduction to the topic of forecasting. Secondly, we provide a short overview on the investigated case company. This is followed by the problem definition stating the main strategic problem and the four supportive research questions. Finally, thesis purpose, delimitations and contributions are presented.

Chapter 2 represents the methodology chapter comprising the techniques and approach that have been applied during the whole process of conducting this study. The research strategies, methods and research design are presented.

Chapter 3 discusses different relevant theories; how these are linked together and how the theoretical framework is conceptualized in order to answer the strategic problem and its subquestions. Chapter 4 presents the empirical findings through our study in Sweden. Chapter 5 deals with the analysis of the empirical findings generated in the previous chapter. Chapter 6 concludes on the research questions as well as on the main strategic question. This is followed by Chapter 7 which is presenting theoretical conclusions as contribution to science. Chapter 8 indicates practical recommendations for the case company, and Chapter 9 provides the reader with suggestions for further research areas.
### 1.8 Time-Plan for Research

The time-plan illustrated below is the graphical representation of the duration of various tasks we achieved, against the progression of time. It allowed us to assess how long each task should take, lays out the order in which tasks need to be carried out and helps us to manage the dependencies between different tasks.

<table>
<thead>
<tr>
<th>Task</th>
<th>Feb.</th>
<th>March</th>
<th>April</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Define research area, strategic &amp; research questions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literature research</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read literature and write critical lit. review</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generate Research Model</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Develop conceptual framework</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draft and pilot interview schedule &amp; questionnaires</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Write Chapter 1, 2 and 3*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obtain ethical approval from the university</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Researching: conduct interviews and field studies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analyze empirical data and research material</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interpret empirical data and research material</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frame arguments and write up</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Hand-in first draft</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final editing and hand-in</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implement Changes and Corrections</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Figure 3: Time-Plan of Thesis Progress, (Source: own)*

(* a more specific description of the contents of thesis chapters can be looked up in the thesis’ outline)
The purpose of this chapter is to present the employed methods and procedures in the research of this thesis. Important to note is that the selected approach might have influenced the final outcome of this thesis. In order to increase the readers’ understanding the chosen approach and the factors affected by this are described in this chapter. Firstly, the scientific approach will be discussed and after that the research strategy. This is followed by a discussion of the case study research design and the next focus will be on the sampling type we utilized. Afterwards the data collection on the combination of primary and secondary data is examined, continued by explaining how we analyzed our data. Finally the issues of validity and reliability are examined in the section 2.6 Quality of Research. In order to provide the reader with an overview of the research process, we developed a seven-step process model illustrating the different methodological steps we applied during our research.

As a detailed description of all techniques would be too extensive for this chapter, we will focus on describing and justifying particular methods used in this study.
2 Methodology

2.1 Scientific Approach

According to Yin (2003: 3) there are three different approaches for conducting research: descriptive, exploratory and explanatory. As we in this research aim to describe and evaluate the efficiency, accuracy and use of an MNC’s sales forecasting process, as well as generate a guideline for future improvements of the existing process, a combination of all three approaches is applied.

At the beginning of the research process we use an exploratory approach as it helps us to identify, define and structure the problem. In order to get a closer insight into theories of forecasting and forecasting practices, we started with an exploratory approach. This is done via an in-depth study of related theoretical topics on the one hand, and interviews with various persons at the case company related to the forecasting process on the other hand. The knowledge gained through these interviews is used to enhance the quality of this study. The descriptive approach is used for observed occurrences; we employ this approach when describing the empirical findings from our field studies and interviews. To relate our empirical findings with the studied theories and analyze the relationships between the different factors, we use an explanatory approach. This will be presented in the final part of the thesis, when the results are analyzed and the conclusions are presented.

When conducting research, authors refer to three different reasoning procedures: inductive, deductive or abductive approach.

In an inductive approach, the research tries to compile the theory after collecting empirical data, ultimately trying to create a theory that explains the information collected. In a deductive approach, the researcher is testing already known theory.

Our research requires a combination of both an inductive and deductive approach, but because of the vast amount of theory already developed on sales forecasting our research will be more on the deductive side than the inductive. Switching between an inductive and deductive approach is also referred to as having an abductive approach. Dubois and Gadde (2002) describe this approach as a mix, a more flexible method that allows the research to move between the two worlds of empirical data and theoretical models. According to them, the abductive approach is characterized by a theoretical framework, an empirical fieldwork and a case analysis, that develops parallel through constantly going back and forth. The use of
systematic combining, i.e. a continuous interplay between theory and empirical observation, makes it possible to refine existing theories and so generate a suitable model to solve the studied problem in this thesis.

Merriam (1998) distinguishes between quantitative and qualitative research. Quantitative research dismantles a phenomenon to examine its single components, i.e. the variables of a study such as numbers and quantities from which statistical analyses are made. Qualitative research examines the phenomenon as a whole; here analysis is made by the researcher’s perception or interpretation of a collection of information that cannot be categorized in numbers. Therefore a qualitative research is appropriate for explorative researchers. Merriam (ibid.) describes the characteristic of this research method as having a developing nature: The ability to respond to changing settings all through the study.

The aim of this thesis is to get an understanding of how the sales forecasting management process should be organized. Therefore, we use a qualitative method, as it allows us to get a deep understanding of how various factors within our study are interlinked. Moreover, it gives us the opportunity to assemble both subjective and objective information, which in the case of assessing the impact of forecasting management on the forecasting process is necessary. It also allows us to gain a deeper understanding of some actions or experiences, such information is rather hard to quantify. Hence, it has to be noted that we will not quantify the data collected from the personnel interviews into statistical categories.

2.2 Research Strategy

Choosing the right strategy is a crucial step when pursuing a desired goal, this necessity applies to companies, organizations, and individuals and as well research. A strategy defines the direction and steps required to reach a certain goal. As discussed in the problem definition, this study aims to explore the phenomenon of forecasting, especially sales forecasting management in order to evaluate whether an MNC can improve accuracy, efficiency and use of current sales forecasting practices.

The choice of the research strategy depends on three circumstances:

1. The type of research question
2. The extent of an investigator’s control over the actual events
3. Whether the focus of the analysis is on contemporary or historical events
According to Yin (2003) there are five different types of research strategies: experiment, survey, archival analysis, history and case study. Table 1 displays these three conditions and shows how each is related to the five major research strategies.

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Form of Research Question</th>
<th>Requires Control of Behavioral Events?</th>
<th>Focuses on Contemporary Events?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>How, why</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Survey</td>
<td>Who, what, where, how many, how much</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Archival analysis</td>
<td>Who, what, where, how many, how much</td>
<td>No</td>
<td>Yes/No</td>
</tr>
<tr>
<td>History</td>
<td>How, why</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Case Study</td>
<td>How, why</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 1: Relevant Situations for Different Research Strategies, (Source: Yin, 2003: 5)

Since our research questions are mainly how questions as well as a contemporary event, which we cannot claim control of, a case study is highly suitable. Furthermore, this research is a study of real-life business context and according to Yin (1994) case study is the best fit for such a scenario.

The undertaken investigation is defined as a case study since the focus is on one particular company and then extrapolated to a general level. Additionally, the research is concentrated on a specific organizational process, i.e. the forecasting process, aiming to have its profound understanding of the context of the contemporary events. Finally, the case study research strategy allows validating the chosen theoretical approach with the empirical example of the case company.

### 2.2.1 Strengths and Weaknesses of a Case Study

Merriam (1998) supports the use of a case study as the insights gathered from a case study can directly influence policy, practice and future research. Merriam (ibid.) agrees with Yin (2003) in choosing a case study, when the aim is to reveal information about a phenomenon we would not otherwise have access to. Merriam describes a case study as a research strategy that offers an in-depth understanding of a situation. A case study’s focus is rather to understand a context than focus on a specific variable and differentiates itself from other types of qualitative research since it provides a holistic account of a phenomenon, intensive descriptions and analysis of specific units. For that reason readers can expand the insights and knowledge base from their own experience. A case study uses the same techniques as a
historical research strategy, but it also uses direct observations and interviews. In our case, the case study strategy gives us many advantages, such as a holistic view of the forecasting, deeper insight into issues related to forecasting processes, management and intelligence. Those are few of the arguments why the case study method is used, approving the application of this research strategy when conducting this thesis.

Nevertheless, there exist some criticisms and considerations about case study research. Yin (2003) describes three common prejudices against case studies. Firstly, the conduct of research for a case study has been criticized for being easily manipulated by the researcher in order to better meet goals and purposes of the study. Therefore, the conduct of research should be demonstrated objectively in order to avoid biases and all gathered information should be reported impartially. It is our opinion that we as researchers had no major biases before conducting this research. We have no incentives to either seek a positive or negative outcome of the research, and our only incentive is to make sure that we have high validity in our research, which we see only as a positive bias.

Secondly, there are concerns in regards of a case study’s appropriateness to draw generalizations of results for the research. Especially single case studies are denounced as providing too little evidence to make a scientific generalization. However, the chosen research strategy is conducted on a theoretical basis, and therefore it is possible to accomplish generalizations to theoretical applications. As we have focused only on one product line of our case company, there could be some issues regarding transferring the results to other product groups. But we expect, through our empirical data findings, to be able to make more conclusive remarks about this and the worst case scenario is that our research might have to be followed up by some interviews with other business lines in order to secure that the results are transferable.

Thirdly, the case study strategy is too time-consuming resulting in massive amounts of information, however, there are new ways for producing shorter and more easily read reports. Besides the full master thesis, we present our empirical findings, analysis and conclusions at the case company. This presentation is an executive summary of our investigation, aiming to secure and share the understanding of the results found in the research.

Merriam (1998) also points out concerns on ethics and biases when dealing with the research. Dubois and Gadde (2002) agree with Yin’s defined prejudices and highlight the traditional criticism against case studies: “to be too situation specific and therefore not appropriate for
generalization. But at the same time they point out arising opportunities, deriving from previously considered problems, the interaction between a phenomenon and its context is best understood though in-depth case studies” (Dubois and Gadde, 2002: 554). And nowadays, case study research has become a common practiced research tool (Yin, 1994 and Dubois and Gadde, 2002).

While conducting this research we are completely aware of the possible disadvantages that can occur when using case study as a research strategy, the considerations not only enable us to better understand the delimitations of the research, but also remind us about the quality of work throughout our research process. Having considered the research problems and the practicability of a case study, this research method seems to be the best choice to be used as our research strategy.

2.3 The Case Study Research Design
There are many different approaches on how to design a case study. Merriam, for example, has an inductive approach to case study, whereas Yin focuses on a deductive approach. This study is neither of these in a mere form, that is why we combine ideas and suggestions from both authors.

2.3.1 Overall Intent
A good understanding of the overall intent is a key factor to accomplish and realize the several steps of the design process. The intent sets the directions for the research strategy and in due course the researcher is able to concretize the research strategy into operational steps. Whereas Yin overlooks this aspect, Merriam (1998) categorizes case studies into three types: descriptive, interpretive or evaluative. Though description is a crucial part of our study; our intent is to investigate how a forecasting process can be improved. Consequently, description is only the first step of research. Both interpretation and evaluation contain description, the main difference is that interpretation aims to conceptualize and build theory whereas evaluation aims to explain and judge through evaluations. Our research aims to explain factors that influence the case company’s current forecasting process and evaluating how forecasting improved in terms of: efficiency, accuracy and use. For that reason, this study’s overall intent is evaluative.

We evaluate this case study from two perspectives. First, in the so-called positive part or positive aspect of research, we form a model based on the creation of a preliminary framework. This part generally includes the following chapters: introduction, methodology,
2. Methodology

theoretical framework, case study description and the analysis chapter where we apply our theoretical framework to analyze the specific case. This positive part might be adapted to our case during the ongoing research as it could occur that we identify more aspects and theories of interest. The second perspective is referred to as the normative part, here we look upon the case from the company’s perspective, evaluate the case and draw recommendations for the company.

Figure 4 summarizes where the different parts, i.e. exploratory, evaluative and normative, are utilized in this thesis.

Figure 4: Progress Model, (Source: own)

2.3.2 The Single Embedded Case Study Design

After identifying the research strategy, the next step is to design the case study. Yin describes the research design as “a logical plan for getting from here to there” (2003: 20). One can also distinguish it as work plan for the research that deals with logical problems and serves as a tool that addresses the initial research question. Through the logical succession it is possible to link the empirical evidence with initial research questions, and finally the conclusions (ibid.). Yin identifies five components that should be considered when designing a case study (2003: 21):

1. The study’s question
2. The propositions
3. The unit(s) of analysis
4. The logic linking of data to the propositions
5. The criteria for interpreting the findings
The first step is to decide whether the research questions entail multiple case studies or if a single case study is sufficient. According to Yin, a single case study is warranted in the following situations (2003: 39):

- Critical case, where the case is testing a well-formulated theory
- Extreme / unique case, where the case represents an uncommon or exclusive situation
- Representative or typical case, where the case represents a classic or symbolic case
- Revelatory case, where the case provides a revelatory purpose
- Longitudinal case, where the case study represents a repeated study over time

Due to the fact that the forecasting process of our case company is believed to be a quite typical process among many MNCs, we consider that our case company represents a typical case. Therefore, to some extent, the conclusions made on this specific case should be applicable to other firms in the same industry. However, we are certain that this would require further investigation.

Considering the second component, i.e. propositions, there are no propositions in our research. Nevertheless, to facilitate the creation of a suitable model for our research problem, we studied and condensed the already existing theory related to forecasting. Thirdly, the choice between a holistic and embedded case study design must be made. This is linked to the fundamental problem of defining what the case study is. Yin explains that the holistic case study contains one unit that is being studied, whereas the embedded case study contains two or more units within the same case study (2003: 39ff). Our study focuses on one separate business area within the whole Volvo Group; therefore VCE Region International can be regarded as a single case. To assess potential improvements of VCE Region International’s forecasting efficiency, accuracy and use of sales forecasts, we find it necessary to study the processes at VCE Region International’s headquarter, at production level, and at ASM or Dealer level. Consequently, our case study is designed according to Yin’s embedded design. Hence, these physical units are linked to the research units we aim to study:
Given that we have no propositions within this study, there is no need to discuss the fourth component: The logic linking of data to the propositions. The last component refers to the interpretation and analysis of findings; here we believe that the criteria for judging the quality of research design can be equally used for the fifth component. Yin (2003) provides four tests commonly used to build the quality of any empirical research, referred to as validity and reliability tests. However, these tests will be discussed later in section 2.6 Quality of Research.

This single-embedded-case study enables us to have a deeper understanding but still have a more holistic view of the studied research problem. This research strategy comprises an all-encompassing method, as it covers the logic of design, data collection techniques, and specific approaches to data analysis that allows a comprehensive research method (Yin, 2003). Thus, we believe that this method is the best fit to find the answer to our research questions.

2.3.3 Sampling

For the sampling on the case company for this case-study we had the convenience that this was given from the start of the research. The research focuses solely on Volvo Construction Equipment, which is one business unit of the Volvo Group. To be even more precise, we concentrate on one of the four sales regions of VCE: Region International. Due to limited amount of time and resources the focus of the study is also limited to one specific product line, i.e. Articulated Haulers located in Braås, Sweden. Hence the deployed sampling strategy is convenience sampling. However, we believe that VCE Region International’s forecasting process reflects a common process. If we would not have had the convenience to get VCE Region International proposed as our case company, we could have chosen it as its forecasting process is regarded as a typical case comparable to other MNCs.
Moreover, this study follows a purposeful sampling strategy. By using this strategy, particular settings, persons or events are selected deliberately in order to provide important information that might not be obtained from other sources. In other words, where required, we selected people whose comprehensive knowledge of, or involvement with forecasting, could assist us in illuminating answers to the questions under study. As said by Patton, “the logic and power of purposeful sampling lies in the selection of information-rich sources for study in depth” (Patton, 2002: 230ff). Merriam (1998) declares that purposeful sampling is based on the assumption that the researcher aims to discover, understand, and gain insight on a specific topic or event. Accordingly, we have to choose – with purpose – the information sources, which will give us insight.

2.3.4 The Researcher’s Role

When designing and conducting a research Fisher (2007) points out to decide on a researcher’s role in the study, referring to the relation of the researcher to the organization and people there. According to Fisher’s criteria, we are “The Academic – a harmless drudge” (ibid., 2007: 58), given that we are visible to the company but we will not be directly involved in the organization studied. This role encloses some assets and drawbacks. On the positive side the researcher gains primary data otherwise not accessible and hard to get through secondary data. Also, the researcher is usually seen as neutral person by the organization what enhances the cooperation and openness of the company. On the negative side, Fisher claims that the organization may put low priority to the conducted research.

This negative aspect will most likely not appear due to the fact that VCE Region International has had master students doing research, and writing thesis for them for several years. Up to today, we can declare that VCE Region International is highly engaged and the researchers by no means feel that the project has low priority. And although we are working in tight-cooperation with our project leader and contact persons, we are aware to maintain the outside perspective required for evaluating the provided data.

2.4 Data Collection

There are several different strategies for purposefully selecting information-rich sources. The logic of each strategy serves a particular purpose. Merriam (ibid.) also suggests starting purposeful sampling with listing criteria. The criteria for our selection of supporting sources thus became:
2. Methodology

- Individuals and small informal groups that are involved in VCE Region International’s forecasting process, e.g. work within the TOD project and/or with the actual SAP4C program
- People who share a common experience and perspective of the forecasting process
- People from different levels within VCE Region International’s organization
- People who: implement, supervise, and utilize the forecasting system

Concerning the selection of the people and the units to study we see it as necessary to interview typical persons involved in the forecasting process from all involved units: Headquarter, Dealers, ASMs, BCs, VPT, and Production Leaders of the product groups. Therefore, the sampling strategy is referred to as typical sampling. The cases are selected with cooperation of key informants, such as program staff or knowledgeable participants, who can help us to identify who and what is typical. We managed to interview people from all levels of the forecasting process, this made it possible to enhance reliability of our research, and obtain a broad picture of the forecasting process.

Merriam (1998) claims that the data collection in a case study research involve different strategies, such as conducting interviews or analyzing documents. The usage of multiple sources of information is advisable as it enables the researcher to have a complete and comprehensive understanding of the research problem.

Fisher stresses the following research methods: interviews, panels, questionnaires, documentary research, and observational research (2007: 158ff). Yin (2003) puts the sources into six more specific methods: documentation, archival records, interviews, direct observation, participant observation and physical artifacts.

For this present study interviews are one of the major sources of information. As far and often as possible we made use of observations throughout these interviews. Due to the fact that some of our interviews are conducted by telephone, mainly by reason of the geographical location in Turkey, Dubai and Sweden of interviewed ASMs and time-constraints of some VPs, we could not make any observations in these cases. To embed several sources available, we will also look into documents, databases, annual reports and company material from VCE Region International. This great mix of several sources of information increases the validity of the collected data and so the quality of this thesis.
Merriam (1998) refers to primary and secondary data when gathering a data collection. In this study, both methods will be employed to complement and validate each other. These two forms are described below, followed by the discussion how the data collection will be used.

### 2.4.1 Primary Data

Primary data is the data collected for a specific research purpose (Merriam, 1998). There are various ways to collect primary data; however, in-depth interviews, observations and focus groups are the most preferred methods. Regarding interviews, there are different forms often divided into structured and semi-structured interviews. Yin (2003) suggests interviews of an open-ended nature, as they enable the researcher to ask about facts but also about their opinion of the studied problem.

As already mentioned in the previous section, qualitative in-depth interviews with employees and management at VCE Region International have been the main source of information for this thesis.

All of our interviews have been performed with a semi-structured character; this made it also possible that our respondents were able to elaborate on certain topics and issues. This information has been valuable to gain information on related topics and insight into specific processes that would otherwise not have been looked upon. Furthermore, we were able to receive information on other relevant persons with valuable information on the studied topic.

Additionally some of our interviews were performed over the telephone. The main drawbacks we experienced when conducting our telephone interviews were that it was not possible to physically see the respondent and therefore it was not feasible to notice things like body language of the interviewee, as well as whether he/she paid attention to the questions or was distracted by other things. Such drawbacks may have caused some biases in these interviews. However, all of our interviewees are involved in the forecasting process and recognize the need for a change in the forecasting process. This awareness makes us believe that the interviewees were paying attention to the questions and likewise to answer them.

Another important aspect to note is that we provided all of our interviewees with questionnaires and an interview-guideline at least a week before the interview, facilitating the interviewees to prepare for the interview. Appendix 11.2 provides examples for such an interview guideline. Appendix 11.3, 11.4 and 11.5 are examples on the developed questionnaire for ASMs, the VPT, and S&OP Leaders.
Besides the interviews, one observation of an internal meeting has been carried out. This observation can be distinguished as a participant observation since the observed persons knew about the observation. The meeting was one of the three major review-meetings involved in VCE Region International’s current forecasting process we will discuss later in the empirical chapter. The main objective was to gain an understanding of how such a review meeting is handled internally.

When collecting the primary data we always used tape-recorders, which enabled us to be more involved in the discussion and make observations. Furthermore, we were able to listen to the tapes several times, what is a crucial advantage for the compiling and condensing of the empirical data. In order to reach validity, different data collection methods, semi-structured interviews and observations, have been applied. Theory refers to that as data triangulation, other types of triangulation concerning multiple sources and methods to confirm the emerging findings are revealed in the following pages.

2.4.2 Secondary Data

Secondary data refers to data that already exists and is collected for another purpose than this specific research, nevertheless this data is applicable and a good source for this study. The secondary data exploited at the beginning of our research originated from various sources. Secondary data consist mainly of publicized form such as articles, literature and reports. Merriam (1998) stresses the importance of a dynamic and continuous process of collecting data during the research process.

For this study, we use a wide extent of literature aiming to generate the theoretical framework. We also emphasize the use of scientific journals as this source of information offers latest articles about our topic and provides the most recent findings. Other sources for collecting our secondary data include: reports, analyst reports, company material (internal and external), academic publications, previous theses and information from the Internet.

The internal material provided by VCE Region International includes the Annual Report, the General Plan 2009, Company Presentation 2009, SAP4C presentation, and various internal reports on forecasting. This material has been helpful to gain an understanding of VCE Region International’s current forecasting practices. The investigation of these manifold secondary sources also aimed to raise the level of validity of the thesis, however, this will be discussed in more detail in the section on quality of research.
2.4.3 Principles of Data Collection

Yin (2003) describes three principles, which aim to maximize the benefits of the applied data collection methods.

The use of multiple sources of evidence

Here, Yin explains the strengths of a case study when several sources of empirical analysis are employed. Triangulation is the rationale for using multiple sources of evidence (Yin, 2003: 97). It allows the research to tackle a broader extent of different issues, such as behavioral, attitudinal and historical. A case study that follows the principle of triangulation is more convincing and is believed to be more accurate, since facts and conclusions are based on several sources providing the same or similar data about the particular fact.

The creation of a case study database

The second principle refers to the documentation and management of the gathered data for the case study. Furthermore, Yin (2003) stresses to keep the actual data separated from the researcher’s narrative presentation of the data. To achieve that, all interviews have to be recorded and afterwards typed into separate documents. This enables the researcher, and other readers, to return to the actual raw data. If the gathered data and information is stored in a structured way, the reliability of the case study increases significantly.

In our case, we taped all conducted interviews, typed them into separate documents and categorized them by date and position of the interviewed person. We also present all necessary information to understand, solve and draw conclusions on the studied problem in the empirical findings chapter.

The maintenance of a chain of evidence

This principle is related to the case study protocol. The protocol is a significant way to increase the reliability of a case study research and its outline should be easy to follow, especially for the external reader. Furthermore, Yin (2003) emphasizes on the flow of the report. It has to have a sequence that enables the reader to comprehend the relation of the empirical data and the initial problem, the proposed solutions and recommendations.

For this study, we created a case study protocol that is used as a guideline for carrying out the data collection. Furthermore it aims to help the external reader to understand how we compiled the gathered data into empirical findings. The illustration of this protocol can be found in Appendix 11.1.
2. Methodology

2.5 Data Analysis
Merriam (1998) describes three different steps that are involved in the analysis of a case study. Firstly, the data must be organized in a typical or chronological order in order to present it in a descriptive manner. Secondly, the data has to be classified into categories, themes or types. These categories derive from looking through documents and transcripts; usually the researcher notices certain patterns, which are used to structure the analysis. The final step involves interferences, developing models and generating a theory.

For this study, we aim to organize the data through a categorization into different topics based on the theoretical framework. This will be followed by a description and presentation of the data according to the chosen structure. The next step will be to find certain patterns while compiling the empirical data, based on that we will categorize our analysis. Lastly, we aim to construct a model illustrating the forecasting process and its components.

2.6 Quality of Research
According to Yin (2003) there are four aspects / tests of the quality of the research in a case study: internal validity, construct validity, external validity and reliability. Each of these aspects has certain strategies in order to improve the trustworthiness and quality of the study.

2.6.1 Internal Validity
Internal validity is concerned with how research findings match with the reality, whether or not findings can be shown to be valid for the studied problem. This issue affects both the empirical and theoretical part of the research. The focus is to measure the right focus when researching. Merriam (1998) suggests six strategies to enhance internal validity: triangulation, checks, long-term observations, peer examination, collaborative modes of research and researcher’s biases. In order to have accurate and convincing findings as well as conclusions in a case study, several sources of information should be used. Yin (2003) highlights triangulation, i.e. the process of combining findings from several sources to reach a conclusion, and identifies four types of triangulation: data triangulation, investigator triangulation, theory triangulation and methodological triangulation.

To increase the internal validity of this study, we used multiple sources of information and methods to confirm the findings, obtained opinions and comments from colleagues and lectors on the findings, and asked the interviewees and respondents to confirm data and interpretations. Hence we utilized triangulation, and peer examination checks as two major strategies to enhance the internal validity of this thesis.
With the aim to increase the quality of this thesis, we used data triangulation to ensure accuracy by gaining information from several interviews at different locations. Furthermore, several theoretical concepts are used as the foundation and modified for our specific research problem. To be precise in this case study triangulation has been achieved through analyzing and interpreting the findings of our interviews, in case of uncertainty concerning emerging evidence we contacted our supervisor to get an external opinion in order to increase the validity.

Occasional meetings with fellow master thesis students made it possible to utilize the peer examination strategy, mainly driven by discussing and commenting on each other’s findings. The fact that this thesis is written in close cooperation with the case company and our supervisor from the university also enhances this thesis’ internal validity.

2.6.2 External Validity

External validity relates to whether or not the study’s findings are possible to be generalized to other cases. According to Yin (2003) case studies can be used as a source for analytical generalization. To enhance external validity researchers can provide a holistic description on the studied issue, describe typicality of the case or replicate similar studies, this enables the reader to compare and evaluate the presented study (ibid., 2003).

For this study, we tried to generalize our findings on forecasting management based on the knowledge from studied theory, gathered empirical data and its analysis.

However, since our conclusions are mainly based on the case company we have not empirically studied other companies with similar markets, products and organizational set-up. Nevertheless, based on the analytical generalization, we believe the thesis’ external validity is to be acceptable.

2.6.3 Reliability

Merriam (1998) describes reliability as the extent to which research findings can be replicated. The question is whether or not other researchers applying the same procedures will have the same results. Yin (2003) explains that the objective of reliability is to minimize errors and biases in the research.

To enhance the reliability of this current study we follow Merriam’s recommendation and do data triangulation and careful documentation of all used data and information (ibid.1998).
2. Methodology

Therefore we made use of audit trails for conducted interviews and described the whole data collection process in detail and if necessary double-checked findings with respondents.

2.7 Research Process Model

Inspired by Dubois’ and Gadde’s (2002) model of systematic combining, we developed the subsequent research process model for this thesis.

![Figure 6: Thesis Research Process, (Source: own)](image)

This seven-step research process illustrates the different methodological steps we apply in our research process. Step 1 represents the initial kick-off meeting at VCE Region International where we received an introduction to the current strategic problem. After this introduction we started our pre-study, where we studied diverse literature and conceptualized suitable aspects and theories. With the gained insight about the topic we developed the main strategic problem followed by four sub-research questions. This step is believed to be one of the crucial steps within the whole research process, as it builds the foundation of the current study. Step 4 contains the selection of suitable techniques and approaches for the methodology part of this thesis, also including the initial research design. The fifth step demonstrates the major element of this case study, i.e. going back and forth between empirical results, theory, framework and the case study while doing analysis, combining and matching of different findings. This step exemplifies the abductive approach of this case study. Step 6 involves the drawing of strategic and academic conclusions, followed by a recommendation for further research.
Before starting to describe the actual topic of this master thesis, i.e. sales forecasting management, we would like to put the topic into perspective. Therefore we begin with a discussion of corporate planning and strategic planning, indicating different strategic management approaches. This is then followed by a walk through the theory on sales forecasting ending up with a theoretical framework used to structure the rest of the research. We will look at the following areas in this chapter: Methods, forecasting management, performance measurement, training, software systems and communication, cooperation and collaboration.
3 Theoretical Framework

3.1 The Forecasting Management Perspective

Today’s business environment challenges many companies’ abilities to cope with fast shifting market conditions. The gap between the awareness of an up-coming event and the actual event is one of the main reasons for planning and forecasting. If the lead-time is long and the outcome of the final event is conditional on known factors, planning can present an important role for a company. In this case forecasting is needed to verify when an event will occur, so that suitable actions can be taken. In the course of time different strategic approaches appeared, all having different foci toward how companies plan, act and react on events with their strategies.

3.1.1 From Corporate Planning to Strategic Management

The evolution of corporate planning to today’s picture of strategic management has been a long and rocky path. Strategic management has been one of the major areas of interest to many academics and researchers since it emerged in the post World War II eras. A large amount of articles and books addressing this new science diffused the conventional idea of corporate planning and set new perspectives.

Formerly corporate planning was set up as a framework for organizing a company’s capital investment decisions and planning long-term development. Traditionally a corporate plan utilized macroeconomic forecasts as basis and consisted of goals, objectives, forecasts of key economic trends, priorities for products and business areas and allocated capital expenditures (Grant, 2008). However, the transition from corporate planning to strategic management demonstrates the shift from planning to strategy making.

The changes in the business environment reinforced the case against strategic planning. In the last quarter of the twentieth century macroeconomic imbalance, exchange rate volatility, the microelectronics revolution and the emergence of newly industrialized countries marked the end of the postwar economic stability (Grant, 2003). This change represents a fundamental challenge for companies to predict demand, prices and so on. The challenge of making strategy when the future is unknown encourages managers’ interest in the application of management flexibility (Van Putten and MacMillan, 2004).
How companies formulate and set their strategies has emerged as an area of intense debate within the strategy field. Mintzberg and Waters (1985) make a distinction between: intended strategy, realized strategy and emergent strategies.

![Figure 7: Forms of Strategy, (Source: Mintzberg and Waters, 1985: 258)](image)

Intended strategy is strategy as conceived by the top management level. This strategy is the result of a process of negotiation, bargaining and compromise, involving many individuals and groups within a company (Grant, 2008). In spite of this, the realized strategy is usually only partly related to what was proposed. In fact, the main determinant of realized strategy is the emergent strategy, i.e. decisions that rise from the complex processes in which individuals interpret the intended strategy and adapt to changing external conditions (Mintzberg and Waters, 1985).

By elaborating the phenomena of intended and realized strategies, Mintzberg and Waters (ibid.) identified eight types of strategies, each embodying different levels of “deliberateness or emergentness”.

These eight strategies can be grouped into two schools of thoughts: the design school and the learning school of strategy (Mintzberg et al., 1998). The former sees strategy formation as a process of conception. Within this approach clear and unique strategies are formulated in a conscious process wherein the internal situation of the company is matched to the external situation of the environment. Hence, this method facilitates order, reduces ambiguity and adds simplicity, which is useful in relatively stable environments. Nevertheless, this simplification may tamper reality and avoid organizational learning. Consequently this approach is rather weak in fast changing environments.

The learning school on the contrary, perceives strategy formation as an emergent process. Here, the management focuses on what works and what does not work. These lessons learned are incorporated into the overall plan of action. This awareness, that the world is too complex to allow strategies to be developed all at once, fosters the understanding that strategies must emerge in small steps as a company adapts and learns. This approach encourages
organizational learning and is valuable in complex conditions with continuous change. However, this school could lead to having no strategy or just doing some tactical maneuvering.

Grant (2008) describes that in most companies strategy is made through a combination of design and emergence. First, at the formal - deliberate level, strategy is generated in meetings at the management level and the strategic planning process. Simultaneously, strategy is continually performed through decisions made by members of the middle management.

In order to exploit a company’s flexibility, adaptability and responsiveness, companies typically deploy a combination of both approaches: bottom-up and top-down processes of strategy making. Thus, the management level may set guidelines in the form of mission statements, business principles and performance targets while the individual business units may then formulate strategic plans (Grant, 2008). This idea of strategy providing overall direction for an emergent, adaptive, responsive process of strategy making, allows a company to act before everything is understood. Furthermore it enables the company inter alia to respond to an evolving reality rather than focusing on a stable fantasy (Mintzberg and Waters, 1985). However, the optimal balance between design and emergence depends on the stability of the external environment.

The environment and industry of the case company studied for this thesis is by nature cyclical. Such companies, exposed to a rather fast changing and unpredictable business environment, must limit their strategic planning to a few principles and guidelines, the rest must emerge as circumstances unfold.

3.1.2 Strategy for Different Time-Frames

In today’s business environment things change rapidly and are unpredictable. This means that today’s strategy may be tomorrow’s disaster. Due to this fact, companies have to create a more adaptive organization, which recognizes change and uncertainty and uses these to its advantage. Van der Heijden (1997) emphasizes that the fewer things are predictable the more attention has to be paid to the strategy process.

Through the perception of diverse signals in the environment, companies are more capable of planning and reacting within two time-levels. First, in the long-term perspective, companies can develop a more robust organizational system. Such a system is able to withstand the unexpected shocks that will come its way. And second, in the short-term perspective,
companies can increase their ability to react and adapt by a more skillful observation of its business environment (Van der Heijden, 1997).

Abell (1999) highlights in his article “Competing Today While Preparing for Tomorrow” the issue of strategic planning. He stresses the need for companies to have dual strategies: Today-for-Today Strategies and Today-for-Tomorrow Strategies (ibid., 1999). Today, change is pervasive in the environment. A single strategy encompassing present and future provides neither the basis for running the existing business effectively, nor for managing change.

Abell (1999) illustrates the example of leading an army, which is usually periodical meaning that every once in a while there comes a time of peace after war. This time frame allows reorganizing troops and preparing for the next battle. Managers of modern companies do not have this luxury. Running a business and changing it, are not sequential but parallel activities. They always have to have parallel strategies, one for the current battle and one for the battle tomorrow, therefore the term dual strategies. Depending on the company’s industry and environment, companies have to find the appropriate balance between a present and a future orientation. In circumstances typified by fast or severe change, the future component should be given the lion’s share of attention (Abell, 1999).

At this point, sales forecasting becomes a valuable source of knowledge. By exploiting diverse market indicators and close communication with customers, the middle- and lower-level management in the forecasting process has much greater access and insight into future developments. Therefore, sales forecasting can help to foresee the current and short-term market development and future opportunities for the company.
Figure 8 illustrates how sales forecasting fits into the whole picture of strategic planning. The horizontal line shows the time-perspective, i.e. present day – future. As the figure indicates, at present day the information level, i.e. presented by the dotted line, is very high. This implies that the available information contributes to a relatively high accuracy, enabling the company to predict how tomorrow is going to look like. The dotted line decreases along the long-term perspective. This shows that only less accurate information is available for long-term perspective, which increases the level of uncertainty.

The grey triangle represents the number of strategies a company can pursue based on the timeline. The closer to the present day we look, the more the company is restrained by investments, operations, industry rules etc., making the strategic span small. The longer we look away from present day, the wider the strategic span gets, representing the endless possibilities that the future holds. Certainly, being in touch with events in the own industry, as well as with events far and wide, all plays an important role. So does the historical perspective. A company that recognizes present events as part of an unfolding narrative that relates past to present and present to future has an advantage in comparison with these companies, who see events only as snapshots in time. As mentioned earlier companies should focus on both the short-term and long-term planning. For both strategies, Strategy-for-Today
3. Theoretical Framework

and Strategy-for-Tomorrow, there are diverse tools at disposal that can be deployed to deal with change in each time-perspective. Sales forecasting suits amongst Strategy-for-Today, fitting with the context of this thesis study.

3.2 The Importance of Forecasting

Forecasting is used in many areas of a company’s daily life such as: Technology-, trend- and sales-forecasting. The focus of this thesis is on sales forecasting, meaning, how companies predict future sales of a current product in order to organize company capabilities and resources accordingly.

De Wit and Meyer (1998) highlight the difficulty of planning: Plans are always based on assumptions about how future events will unfold. In order to plan one must assume that the future is going to be somehow connected to the past. In other words “Planning must be based on the assumption that something is predictable, if the future is 100 % uncertain, planning is obviously a waste of time” (Van der Heijden, 1997: 16). Hence, plans require accurate sales forecasts. Without precise sales forecasts, long-term production planning would be impossible. In other words sales forecasting is crucial in order to create efficient resource allocation (Wacker and Lummus, 2002). But how reliable and accurate are forecasts in a highly dynamic and fast changing business environment like today?

Makridakis (1990: 66), one of the most proliferated writers on the topic of forecasting, states: “the future can be predicted only by extrapolating from the past, yet it is fairly certain that the future will be different from the past.” Consequently, it is clear that rigid long-term plans based on unreliable forecasts could amount to nothing less than Russian roulette. Therefore over-deterministic plans should be avoided. For that reason De Wit and Meyer (1998: 154ff) summarize and argue two approaches towards planning:

- Contingency planning, where a number of alternative plans are kept in reserve in case key variables in the environment suddenly change. Such contingency plans are commonly based on different future scenarios (Van der Heijden, 1997).
- Regular reviews and realignments of the strategic plans to match the altered circumstances. Such reviews are usually accomplished by going through the planning cycle every year and adapt plans to fit with the new forecasts.

Figure 14 on page 55 illustrates that there are various linkages among the forecasts of different divisions or departments within a company. These linkages also show the
interdependence of needs between various functions within a company such as purchasing, production, finance and general management within a company. Since each function of a company is related to each other, a good or bad forecast can affect the entire company. According to Makridakis et al. (1998) there are three major areas in a company’s planning for which forecasting currently plays an important role:

1. Scheduling
   Efficient use of company resources requires the scheduling of production, transportation, personnel and so on. Forecasts of the level of demand for product, material, labor or service are a vital input to such scheduling.

2. Acquiring resources
   The lead-time for purchasing raw materials, hiring personnel, or buying machinery can differ from a few days to quite a lot of days. Hence forecasting is required to determine upcoming resource requirements.

3. Determining resource requirements
   Companies must determine what resources they want to have in the long-term. Such assessments rely on market opportunities, environmental factors and a company’s internal resources. These assessments all require forecasts and people who can interpret the predictions and make appropriate decisions.

Moon et al. (2003) go more into detail by noting that effective and accurate sales forecasting can help companies to:

- Identify market opportunities,
- Enhance relationships,
- Increase customer satisfaction,
- Reduce inventory investment,
- Eliminate product obsolescence,
- Improve distribution operations,
- Schedule more efficient production,
- Anticipate future financial, and capital requirements.

Especially on the inventory level, accurate sales forecasts can have a great effect; carrying too high inventory levels may cause avoidable costs. As Moon et al. (1998:44) state “Inventory exists to provide a buffer for inaccurate forecasts, thus the more accurate the forecasts, the less inventory that needs to be carried, with all the well-understood cost savings that brings”.

A study on the purpose of forecasting by White (1986, in Winklhofer, 1996) demonstrates that 64% of the respondents use forecasts as a goal-setting device, and only 30% forecast to get a true assessment of the market potential. While the difference might seem small, it relates
3. Theoretical Framework

to a general problem discussed in the next section: the determination between planning versus forecasting. Forecasting should always be used for what it is, and that is an assessment of the future market-potential under specific circumstances – a key base for planning.

Therefore sales forecasting should be seen as a major contributor to the competitiveness of any company. The question whether to forecast or not, seems not fitting for sales forecasting. Fact is that all companies in some way or another forecast their sales in order to create an efficient supply chain. Therefore the question should be how to conduct efficient and accurate sales forecasts. Not why.

3.3 Forecasting Management

There is little research specific to forecasting management. However, some articles based on empirical evidence provide guidelines for managing the forecasting function in a company. This section deals with the issue of differentiating forecasting and planning as well as discussing several aspects of forecasting management.

3.3.1 Forecasting versus Planning

The understanding and accomplishment of a company’s forecasts versus a company’s plans are crucial tasks. Many companies fail to predict the demand in the market but instead predict their own ability to supply goods (Moon et al., 1998), this especially happens when a forecast is based on historical shipments.

As seen in Figure 14 on page 55, forecasting is a contributor to the overall planning process of a company. Within this process a transformation filter converts the actual forecasts into organizational plans such as production-, marketing-, and logistic plans. This transformation is done via integrating the various indicators from the external environment and the company’s internal resources (Makridakis et al., 1998).

An essential component of any sales forecasting process is its implementation as a step-by-step procedure of sales forecasting and planning (Mentzer and Moon, 2004). The first task is to ensure that all employees have a common understanding of the actual process of forecasting. Therefore, management should try to define and illustrate this process and so provide its employees with an overview of the total process. Figure 9 illustrates a simple example of such an iterative process.
The understanding of the actual process might facilitate the determination, but also the linkage, of forecasting and planning. Moon and Mentzer (2004: 37ff) identify three types of companies defined by their way of developing forecasts:

1. Companies having a naïve approach, using their business plans to derive the sales forecast. This is referred to as naïve because a forecast should be driven by the realities of the marketplace not by the financial needs.

2. Companies developing the sales forecast independently of the business plan. However, they adjust it in case the forecast and the plan differ.

3. Companies starting with the sales forecasting process. These are the most effective. They start with a projection of the future estimated demand. This is based on expected economic and competitive conditions and initial marketing-, sales-, production-, and logistic plans. From this base they finally develop the business plan. In case the business plan does not meet with the company’s financial goals, the company iterates back to the sales forecast. The observation of possibilities and additional efforts in marketing and/or sales makes it possible to increase the demand forecast. Furthermore possibilities to increase production and logistic capacities might be revealed. This iterative process, going
back and forth between sales forecasts and business plans, is necessary to meet the business plan.

Moon and Mentzer (2004) describe this aforementioned iterative process as validation, guaranteeing that a business plan is based upon the financial and marketplace realities facing the company. So forecasts and plans are by nature intermingled. In order to be effective, companies have to transform the actual sales forecast into operational plans that have strategic importance.

3.3.2 Seven Keys to Better Forecasting

Moon et al. (1998) suggest seven key principles for forecasting management that, if applied correctly, could increase a company’s efficiency and accuracy in forecasting. These principles are based on the author’s long involvement and experience in the field of forecasting. Their empirical evidence is proofed via application in numerous national and multinational companies.

These seven key principles are the following (ibid., 1998: 45):

1. Understand what forecasting is and is not
2. Forecast demand, plan supply
3. Communicate, Cooperate, and Collaborate (CCC)
4. Eliminate islands of analysis
5. Use tools wisely
6. Make it important
7. Measure, Measure, and Measure

The following section provides a description of all seven keys. In addition, a summarizing table is presented, indicating: issues, symptoms as well as actions to take for each key. These descriptions and summaries are based on various findings from the authors Moon and Mentzer.

**What forecasting is and what forecasting is not!**

Moon and Mentzer define a sales forecast as “a projection into the future of expected demand, given a stated set of environmental conditions” (ibid., 2004: 38). As already stated earlier in this chapter, companies have to share a common understanding of their forecasting practices and its purpose. Even though it is possible to use vast amounts of resources to buy and
implement complex forecasting software systems, it is crucial that the company understands that this is only a small element in the whole process of forecasting (Moon et. al., 1998).

Forecasting often gets mixed together with planning and goal setting. This confusion can lead to game-playing, i.e. intentional over- or under-forecasting, a common source of bias negatively influencing the accuracy of a forecast. However, this issue is discussed more detailed in section Judgmental Biases in forecasting.

Moon et al. (1998: 46) have the following separation of the different tasks: “A sales forecast should be viewed as an estimate of what future sales might be, given certain environmental conditions. A sales plan should be seen as a management decision or commitment to what the company wants to do during the planning period. A sales goal should be a target that everyone in the organization strives to attain and exceed.” This separation is important because it divides the current evolving environment and the environment the company wants to develop.

Table 2 summarizes issues and symptoms of the first key: Understanding what forecasting is and what it is not. Furthermore, actions that can be taken to resolve these issues and the ensuing results are shown.

<table>
<thead>
<tr>
<th>ISSUES &amp; SYMPTOMS</th>
<th>ACTIONS</th>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Computer systems as focus rather than management processes and controls</td>
<td>• Establish forecasting group</td>
<td>• An environment in which forecasting is acknowledged as a critical business function</td>
</tr>
<tr>
<td>• Blurring of the distinction between forecast, plans and goals</td>
<td>• Implement systems before selecting forecasting software</td>
<td>• Accuracy emphasized and game-playing minimized</td>
</tr>
<tr>
<td>• Derive plans from forecasts</td>
<td>• Distinguish between forecasts and goals</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: What forecasting is and what it is not, (Source: adapted from Moon et al., 1998)

**Forecast demand, Plan supply**

Imagine a scenario with a company using previous sales figures as a base for forecasting future sales. In this scenario the company sells 10,000 units in a given month x, i.e. the production maximum. For the following month, i.e. x+1, the forecaster utilizes the previous sales number of 10,000 units as a base for the forecast of the current month. By doing that, companies rather forecast their ability to supply than the actual demand in their markets.

This way of forecasting is called naïve forecast, the simplest form of sales forecasting.
Although it seems simple and logical, there is assured drawback when forecasters use previous sales numbers as a base for a forecast. By solely utilizing previous sales numbers a company might oversee the potential of higher demand in their market. This example, among others, illustrates the necessity to separate planning and forecasting as it might lead to discovery of “hidden” market potentials. Certainly, it is not easy to predict the “true” market demand, but for any company’s long-term planning it is important to discover and consider hidden market potentials. This information can be used for future investments such as for their capacity amplification.

Table 3 summarizes issues and symptoms of the second key. Moreover it provides actions that can be taken to resolve these issues and the ensuing results.

<table>
<thead>
<tr>
<th>ISSUES &amp; SYMPTOMS</th>
<th>ACTIONS</th>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Shipment history as the basis for forecasting demand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Too accurate forecasts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Identify sources of information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Build systems to capture key demand data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Improved capital planning and customer service</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Forecast demand, plan supply, (Source: adapted from Moon et al., 1998)

*Communicate, Cooperate, and Collaborate (CCC)*

CCC should be considered as a three-step improvement process:

1. **One-way communication**
   The first step is one-way communication allowing different functions in the company to share their forecasts. However, often mistrust arises as there is no common understanding and reasoning behind the forecasts. Moreover, situations occur that functions sense the missing involvement within other functions’ forecasts, another source of mistrust and tension.

2. **Cooperation and two-way communication**
   The second step is accomplished, when all functions have cooperated forecasting processes. This is usually done via two-way communication that improves the forecasting process. However, the ownership of the forecasting stays at one function still leading to biased situations.

3. **Collaboration**
The third step is characterized by true collaboration within the whole organization. This is realized when all functions of a company come together and develop a consensus forecast. This ultimately leads to a better overall understanding of the forecasts, but also to improved forecasting accuracy and efficiency within the functions. To develop a higher degree of collaboration Mentzer et al. (1998) highlight the importance and usefulness of a forecasting champion. The forecasting champion is a person who oversees the whole forecasting process. The foremost job of this person is to lead the forecasting process and secure that islands of analysis are avoided.

Table 4 summarizes issues and symptoms of the third key: communicate, cooperate, and collaborate. Furthermore actions that can be taken to resolve these issues and the ensuing results are presented.

<table>
<thead>
<tr>
<th>ISSUES &amp; SYMPTOMS</th>
<th>ACTIONS</th>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Duplication of forecasting effort</td>
<td>• Establish cross-functional approach to forecasting</td>
<td>• All relevant information used to generate forecasts</td>
</tr>
<tr>
<td>• Mistrust of the &quot;official&quot; forecast</td>
<td>• Establish independent forecast group that sponsors cross-functional collaboration</td>
<td>• Forecasts trusted by users</td>
</tr>
<tr>
<td>• Little understanding of a forecast’s impact through the firm</td>
<td></td>
<td>• Islands of analysis are eliminated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• More accurate and relevant forecasts</td>
</tr>
</tbody>
</table>

Table 4: Communicate, Cooperate, and Collaborate (CCC), (Source: adapted from Moon et al., 1998)

Eliminate Islands of Analysis

When communication is lacking between different functions in a company, islands of analysis emerge (IOA). In such a situation, the same forecasts are produced several times by different functions, often with different variables and biases. So each area maintains a separate process, thereby performing redundant tasks and often has similar responsibilities. These IOA occur as there is a lack of trust and communication between the departments. This situation costs the company resources and extra man-hours to carry out forecasting several times. Islands of analysis are often supported by independent computer systems, often not interlinked to other systems within the company. Information contained within these different islands is not shared between them. Therefore management should try to develop a joint database for forecasting and try to implement systems which go across all functions making communication, cooperation and collaboration possible, not working against it.

Table 5 summarizes issues and symptoms of the fourth key. Furthermore, it provides actions
that can be taken to resolve these issues and the ensuing results.

<table>
<thead>
<tr>
<th>ISSUES &amp; SYMPTOMS</th>
<th>• Mistrust and inadequate information, leading different users to create their own forecasts</th>
</tr>
</thead>
</table>
| ACTIONS           | • Build a single "forecasting infrastructure"  
|                   | • Provide training for both: users and developers of forecasts                               |
| RESULTS           | • More accurate, relevant, and credible forecasts  
|                   | • Optimize investments in information and communication systems                             |

Table 5: Eliminate Islands of Analysis, (Source: adapted from Moon et al., 1998)

Use Tools Wisely

This key principle deals with various tools available to produce a forecast, and increase the accuracy of the forecasting process. A typical error found in many companies is that they focus too much on a single tool. Either they solely focus on qualitative forecasts also referred to as judgmental forecasts, or on quantitative forecasts, also referred to as statistical forecasts.

Moon et al. (1998: 49) emphasize that both quantitative and qualitative tools are integral to effective sales forecasting. A detailed description of the most relevant tools and techniques, suitable for this case study, are described later in the section Forecasting Methods and Techniques.

Table 6 summarizes issues and symptoms of the fifth key: Use Tools Wisely. Furthermore, actions that can be taken to resolve these issues and the ensuing results are presented.

| ISSUES & SYMPTOMS | • Relying solely on qualitative or quantitative forecasting methods  
|                   | • Cost/benefit of additional information |
| ACTIONS           | • Integrate quantitative and qualitative methods  
|                   | • Identify sources of improved accuracy and increased error  
|                   | • Provide instruction |
| RESULTS           | • Process improvements in efficiency and effectiveness |

Table 6: Use Tools Wisely, (Source: adapted from Moon et al., 1998)

Make it Important

Many companies will agree that forecasting sales is a task of strategic importance, but this rarely fits reality. In many companies there is a lack of rewarding or punishing based on
forecast performance. Without any positive or negative evaluation it is hard for employees to attach importance to a task like forecasting. In order to create a corporate culture that perceives forecasting as important, companies have to:

- Offer training for people involved in forecasting process
- Measure the forecasters’ performance
- Offer the right reward system

Examples on how to perform and improve training, performance measurement and rewarding follow within the next pages.

Table 7 summarizes issues and symptoms of the sixth key, as well as providing actions that can be taken to resolve these issues and the ensuing results.

| ISSUES & SYMPTOMS | • No accountability for poor forecasts  
|                   | • Developers lacking of understanding how the forecasts are used |
| ACTIONS           | • Train developers to understand the implications of poor forecasts  
|                   | • Include forecasts performance in the individual performance plans and reward systems |
| RESULTS           | • Developers take forecasting seriously  
|                   | • Developers strive for forecasting accuracy  
|                   | • Increased accuracy and credibility |

Table 7: Make it important, (Source: adapted from Moon et al., 1998)

Training

Training is a crucial aspect in the forecasting process; a well-educated and trained forecaster is not only superior regarding forecasting practices or forecasting accuracy, but also better motivated!

Companies can evaluate the efficiency of their training according to the following aspects (Mentzer and Moon, 2004):

- Personnel sophistication involved in the forecasting function,
- The personnel’s educational background on statistics or econometrics,
- Level of experience and knowledge of their industry.

If the overall level is rather low, additional training of the sales forecasting personnel should be considered. Here it is important that the company distinguishes between the different training needs of their personnel. Personnel having business experience could receive training
for statistical analysis. Whereas, personnel having statistical backgrounds should rather get additional training in judgmental analysis and have the possibility to acquire practical business experience within this field.

Training should be recognized as an ongoing process in order to keep the personnel trained in those areas of sales forecasting that are most appropriate to their responsibilities. Hence a company can draw a distinction between personnel involved in:

- The maintenance of statistical forecasts
- The adjustment through judgmental forecasts
- The utilization of forecasts

Personnel involved in the maintenance of statistical forecasts should be trained in the correct use of the different quantitative methods and how to make judgmental adjustments. Whereas personnel that is involved in the judgmental adjustments of statistical forecasts should be trained in how to utilize experience and external input to systematically make judgment forecast. Moreover such personnel has to know how to document and report the forecasting process; ultimately developing a logical process that is understandable and useable for others involved in the forecasting.

Finally, the personnel that use and transform the actual forecasts into plans should receive training to be able to understand the total process behind the creation of a forecast. This total picture of the process starts with the development of the forecasts and the various limitations a forecaster has to deal with (Mentzer and Moon, 2004).

Motivation and Incentives – Performance Rewards

Companies can motivate their employees by both intrinsic and extrinsic rewards. In order to be effective, both sources of motivation need to be recognized in the reward system. Reward systems are generally based on the idea of attracting, retaining and motivating people (Tropman and McAdams, 2001).

Financial rewards might seem as an important component, but there are other factors that motivate and influence an employee’s level of performance. Indeed, numerous studies have shown that money is not the most important motivator, and in several cases money had a demotivating or negative effect on employees (Gooderl Longenecker et al., 2006). Another example is an experiment made by Remus et al. (1998) who showed that financial incentives have no immediate impact on the accuracy of forecasting of a selected time series. However,
the research was conducted with students performing a single forecast based on a fictional time series, so it is still unclear if financial incentives would work in a real life setup.

To guarantee that a reward system is effective and motivates, it is essential to consider cautiously the incentives and strategies employed, as well as to make sure that these rewards are connected to, or based on, performance. This performance rewarding should be considered as an ongoing managerial activity, not only an annual pay-linked practice (Thorpe and Homan, 2000).

As already stated, strategies for compensating employees include both non-financial and financial aspects. In fact, it is upon the company to decide and choose the most appropriate ways to compensate and motivate its employees.

There are myriad ways to do that as for example (Gooderl Longenecker et al., 2006):

- Recognition from supervisors
- Challenging work assignments
- Professional growth
- Development opportunities
- Paid leave
- Promotion
- Progression through the remuneration range
- Lateral moves
- Informal rewards

These are just a few examples on how a company could reimburse its employees, but certainly a good reward- and remuneration- system has an essential influence on employees’ motivation. Another simple way is the usage of feedback-loops. Several authors point out the importance of feedback-loops and their impact on motivation and performance.

Motivated employees achieve a great deal, whereas unmotivated employees tend to be slow.

*Measure, Measure and Measure*

Before a company is able to make any evaluation of performance, measurement is needed. This is also important for a company’s forecasting performance. A company that measures the accuracy and efficiency of its forecasting procedures is able to identify sources of errors. Hence, the forecasting contributors can learn from what was effective and correct, and what was not. This is validated by a statement of Lawrence et al. (2006: 507): “One of the key findings in the last 25 years is that feedback can be valuable because it enables the judgmental forecaster to learn.” They further state that sending systematically feedbacks to the forecaster improves accuracy. But there are different ways of doing this. In some cases the most efficient way is to present the forecaster a graphical overview of his last forecast and its accuracy. In
other cases it is better to tell the forecaster on which indicators he has been putting too much weight into (ibid, 2006).

Even though it has been one of the key findings in the forecasting literature through the last 25 years, measuring and linking that measurement to rewards is one of the areas that lack the most attention in today’s business (Moon et al., 2003).

Table 8 summarizes issues and symptoms of the seventh key: Measure, Measure and Measure. Furthermore, it provides actions that can be taken to resolve these issues and the ensuing results.

<table>
<thead>
<tr>
<th>ISSUES &amp; SYMPTOMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Not knowing the firm is getting better</td>
</tr>
<tr>
<td>• Accuracy not measured at relevant levels of aggregation</td>
</tr>
<tr>
<td>• Inability to isolate sources of forecast errors</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Establish multidimensional metrics</td>
</tr>
<tr>
<td>• Incorporate multilevel measures</td>
</tr>
<tr>
<td>• Measure accuracy whenever and wherever forecasts are adjusted</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Forecast performance can be included in individual performance plans</td>
</tr>
<tr>
<td>• Sources of errors can be isolated and targeted for improvement</td>
</tr>
<tr>
<td>• Greater confidence in the forecast process</td>
</tr>
</tbody>
</table>

Table 8: Measure, Measure and Measure, (Source: adapted from Moon et al., 1998)

Performance Measurement

The basic management principle for forecasting by Mentzer and Moon (2004: 44), “What gets measured, gets rewarded and what gets rewarded, gets done”, makes the necessity of performance measurement clear and easy to understand. This necessity is furthermore illustrated by the following quote:

"Measurement is the first step that leads to control and eventually to improvement. If you can't measure something, you can't understand it. If you can't understand it, you can't control it. If you can't control it, you can't improve it." (H. James Harrington, 1611-1677)

This principle implies that forecasting management has to determine what needs to get done, then measure it and reward those who did it. Accuracy is the most relevant performance measurement for a sales forecast. Nevertheless, a company’s overall goal is to obtain a level of accuracy that helps to plan better. Hence, Mentzer and Moon (2004) emphasize the importance of weighting sales forecasting accuracy against:

- The dimensions of the supply chain costs
In other words, the money invested in forecasting should be viewed as a return on investment, a decision investment with the returns of lower supply chain management costs and superior customer service. According to that Mentzer and Moon (2004) identify three “dimensions” to sales forecasting performance: sales forecasting accuracy, sales forecasting costs and customer satisfaction.

Sales forecasting Accuracy

The main idea behind the concept of sales forecasting accuracy is to know how accurate the company forecasted in any given time period compared to the actual sales for that period.

There exist myriad of accuracy statistics, which can be classified into three groups. As a detailed description would exceed the purpose for this thesis, we provide an overview of these three groups, indicating the different techniques that can be applied.

<table>
<thead>
<tr>
<th>Actual Measures</th>
<th>Measures Relative to Perfect Forecast</th>
<th>Measures relative to a Perfect Forecasting Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Mean Error</td>
<td>• Percent Error</td>
<td>• Technique Accuracy Benchmark (SFTAB)</td>
</tr>
<tr>
<td>• Mean Absolute Error</td>
<td>• Mean Absolute Percent Error</td>
<td></td>
</tr>
<tr>
<td>• Sum of Squared Errors</td>
<td>• Year-to-Date Mean Absolute Error</td>
<td></td>
</tr>
<tr>
<td>• Mean Squared Error</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Relating to units, and in what degree the forecasted number of units was off from the actual sales

Relating to the percentage off from the forecasted numbers and the actual sales

Benchmarking the current forecasting method with naive forecasting.

Example: The observations were 4 units of from the forecasted

Example: The observations were 4% of from the forecasted

Example: By using the previous sales numbers as forecast for next month, we could have improved forecast accuracy by 4%

Figure 10: Different methods for measuring forecasting accuracy, (Source: adapted from Mentzer and Moon, 2004: 45ff)

We selected one technique, which is believed to be the most practiced method, i.e. Mean Absolute Percentage Error (MAPE), and explain this one method in further detail.

The MAPE is a way of measuring accuracy applied in the majority of companies (Moon and Mentzer, 1999). The MAPE method provides an overview of how much the actual sales and the forecasts differed from each other. This presents an absolute figure; so it does not indicate
whether the forecasts are generally above or below actual sales. It just shows by how much the forecast differed from the actual sales over a period of time.

Figure 11 illustrates that a supplementation of the MAPE with the MPE (Mean Percentage Error) results in an outline of how far the actual sales were from the forecasts, and if they are generally above or below the forecast. Of course the MAPE itself does not provide any reasoning why the forecasts were accurate or inaccurate. But it is the first step in the process of improving your forecasting abilities.

<table>
<thead>
<tr>
<th>Period</th>
<th>Observation</th>
<th>Forecast</th>
<th>Error</th>
<th>Percent Error</th>
<th>Absolute Percent Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>t</td>
<td>$Y_t$</td>
<td>$F_t$</td>
<td>$Y_t - F_t$</td>
<td>$\frac{Y_t - F_t}{Y_t} \times 100$</td>
<td>$\left</td>
</tr>
<tr>
<td>1</td>
<td>138</td>
<td>150.25</td>
<td>-12.25</td>
<td>-8.9</td>
<td>8.9</td>
</tr>
<tr>
<td>2</td>
<td>136</td>
<td>129.5</td>
<td>-6.5</td>
<td>-2.6</td>
<td>2.6</td>
</tr>
<tr>
<td>3</td>
<td>152</td>
<td>157.25</td>
<td>-5.25</td>
<td>-3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>4</td>
<td>127</td>
<td>143.5</td>
<td>-16.5</td>
<td>-13.0</td>
<td>13.0</td>
</tr>
<tr>
<td>5</td>
<td>151</td>
<td>138</td>
<td>13</td>
<td>6.6</td>
<td>6.6</td>
</tr>
<tr>
<td>6</td>
<td>130</td>
<td>127.5</td>
<td>2.5</td>
<td>1.9</td>
<td>1.9</td>
</tr>
<tr>
<td>7</td>
<td>119</td>
<td>136.25</td>
<td>-17.25</td>
<td>-13.2</td>
<td>13.2</td>
</tr>
<tr>
<td>8</td>
<td>153</td>
<td>141.5</td>
<td>11.5</td>
<td>7.5</td>
<td>7.5</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>-26.0</td>
<td>62.1</td>
<td></td>
</tr>
</tbody>
</table>

Figure 11: Example of MAPE Calculation, (Source: Makridakis et al., 1998: 45)

**Sales Forecasting Costs and Customer Service**

The primary reason why accuracy is most often implicated with sales forecasting performance is that it is the most straightforward evaluation method. The dimensions costs and customer service have less direct relationships with forecasting. For that reason this section discusses the interrelation between these dimensions and shows the impact sales forecasting accuracy has on both of them.

The cost dimensions involve three major steps of the supply chain: management-, operations- and marketing costs (Moon and Mentzer, 2001: 60ff).

The first, management costs, is related to the costs of managing the sales forecasting function. These costs are divided in fixed and variable expenses, connected to:

- Staffing the function
- Training the personnel that develops and uses the sales forecast
- The supply of computer systems to maintain relevant data
- Analyzing that data
Communicating the ensuing information

Operational costs such as production and logistic costs can negatively be affected by sales forecasting inaccuracy. Even if the company’s production system works perfectly, wrong quantities of products can be produced based upon the sales forecasts. The results are raising inventory levels, ultimately creating higher carrying cost of inventory. Even if a company realizes errors and tries to modify its production schedule, these changes also cause higher costs.

An inaccurate forecast may also affect marketing costs such as trade promotions, ineffective advertising, and inappropriate sales quotas. The last “dimension”, customer service and satisfaction, may also be harmed through inaccurate sales forecasts, resulting in dissatisfied customers by both designing and producing products customers do not want.

Putting all dimensions together, it is obvious that performance measurement contains more than just calculating sales forecasts accuracy. Moon and Mentzer (1999) support this opinion and clarify that no company is successful simply because of more accurate forecasting. Hence, a company has to utilize more accurate forecasts and translate them into higher levels of customer service and lower supply chain costs. If not, the impact of improved forecast accuracy is lost.

3.3.3 Forecasting Methods and Techniques

Research on forecasting is extensive and includes numerous studies testing alternative methods in order to determine which ones are the most effective. Generally speaking, it is possible to classify all methods into two main groups, i.e. statistical methods and judgmental methods. Makridakis et al. (1998) states that traditionally judgmental forecasting, also known as subjective method, is used to higher degree than statistical, known as objective method.

So forecasting contains methods that derive from judgmental sources and from statistical sources. Figure 12 illustrates Armstrong’s (1999) summary of the different methods and their relationships demonstrated by the dotted lines. As Figure 12 demonstrates, there is an increasing amount of integration between judgmental and statistical data and procedures.
According to Armstrong and Collopy (1998), an integration of both methods can improve the accuracy of forecasting. However, the aspect of integrating both methods is discussed later in this chapter. First we aim at giving a brief overview of the most appropriate judgmental, as well as statistical forecasting methods for this study.

**Judgmental Forecasting Methods**

Judgmental forecasting methods make use of human judgment, helping to incorporate inside information and knowledge, as well as managers’ expectations, about the future. Whenever a company utilizes individuals to create forecasts, the accuracy of that forecast is dependent on a person’s knowledge of the market in focus. This knowledge is referred to as domain knowledge.

Webby et al. (2001: 390) define domain knowledge as “the result of applying human interpretation to contextual or environmental information”. Lawrence et al. (2006: 499) define domain knowledge as “any information relevant to the forecasting task other than the time series”.

For this thesis we have chosen to define domain knowledge as: Information dependent on contextual information, i.e. market information that is not accessible through statistical data mining. Armstrong (2005) explains that although many managers have valuable domain knowledge, which could be used to improve forecasting accuracy, many companies do not
utilize this valuable information. But in fact, it is not only a company’s managers who possess valuable domain knowledge. One of the most typical used sources for domain knowledge is the sales staff. The sales staff has a close connection to the customers and is very likely to be the first to notice new trends in the market.

In the following pages a brief overview of judgmental methods is given. A detailed explanation of all judgmental forecasting methods would be too excessive, especially since this thesis solely deals with sales forecasting. Therefore, the most suitable methods related to the context of this thesis are chosen according to theory.

**Intentions**
Intentions surveys measure individuals’ plans, goals, or expectations about future plans. This survey data can then be analyzed to derive forecasts. Armstrong et al. (2000) characterize this method as rather inexpensive to acquire and easy to understand. Armstrong (1985) describes certain conditions when intentions data is most useful for predictions:

- The event being predicted as important
- The respondent has a plan
- The respondent can fulfill the plan
- New information is unlikely to change the plan over the forecast horizon
- Responses can be obtained from the decision maker
- The respondent reports correctly

Conditions like these are likely to be met for short-term purchase intention surveys, for expensive goods and services (Armstrong et al., 2000). This implies that intentions data could potentially enhance accuracy of forecasts based on historic sales.

**Expert Opinions**
This method refers to forecasts obtained in a structured way from two or more experts. It depends on various conditions such as: dispersal of knowledge, access to experts, expert motivation and time constraints. Ashton and Ashton (1985) recommend combining independent forecasts from a group of experts, whereby the level of expertise does not have to be extremely high, and weight each expert’s forecast equally.

Rowe (2007) presents evidence that the accuracy of expert forecasts can be improved through the use of the Delphi technique. This is an iterative survey, where experts are asked to provide reasoning for their forecasts, to respond and give feedback to the forecasts done by other anonymous experts (Green et al., 2007). This feedback and information is then used to revise
3. Theoretical Framework

the forecasts. If done properly, this method enhances unbiased estimates and forecasts and
takes full account of the knowledge and judgment of all experts (Rowe, 2007).

Judgmental Bootstrapping
This method converts subjective judgments into objective procedures. Armstrong (2005: 39)
explains this method fairly simple: “it is that a simple model of the man will be more accurate
than the man, the reasoning is that the model applies the man’s rules more consistently than
the man can.”

Bootstrapping can help to identify biases in the way experts make predictions, and it can
reveal how the best experts make predictions. Once developed, judgmental bootstrapping
models offer a low-cost procedure for making forecasts. Compared to judgmental forecasts,
this method provides an improvement and greater accuracy (Armstrong, 2001a). Another
advantage of this method is that it shows experts how they weight various factors, which
helps to improve the forecasts. Moreover, bootstrapping allows estimating the effects of
changing key variables when no historical data is available, therefore avoiding appraising this
data with econometric methods (Armstrong, 2005).

Sales Force Composite
A sales force composite is a qualitative forecasting method that uses the experience and
knowledge of a company’s salespeople, sales management, and channel members to produce
sales forecasts (Mentzer & Moon, 2004). Mentzer and Moon (ibid.) explain three approaches
for the sales force composite: The grass roots approach, the sales management approach and
the distributor approach to the sales force composite.

The grass roots approach accumulates sales forecasts for the regions, products, and customers
of individual salespeople. Whereas the sales management approach seeks sales forecasts from
a higher level, e.g. sales executives or marketing executives, demonstrating the executive
opinion. In the distributors approach the sales predictions of independent distributors of a
company’s products are gathered.
Figure 13 illustrates the three different approaches.

A survey on 1,024 salespeople’s forecasting practices, conducted by Mentzer and Moon (2004: 170ff), highlights common criticism and issues related to sales force forecasting:

- 82% of the interviewed salespeople participate in forecasting,
- Only 14% of the salespeople receive(d) training in forecasting,
- Almost half of the interviewees state that they have either no, little, or some knowledge of what happens to their forecasts after submitting,
- Only 16% have access to forecasting software,
- Less than half of the salespeople believe that the quality of their forecasts affect their performance evaluation.

These findings illustrate that there exists a considerable gap between the expectations companies have on their salespeople, and their actual performance as well as the use of resources provided.

Nevertheless, there are important advantages linked to the sales force forecasting technique. Firstly, this method facilitates to incorporate the expertise of people who are closest to the customer. Secondly, this technique places the forecasting responsibility on those who both have the ability to directly affect product sales and the potential to experience the impact of forecasting errors.

Despite all the advantages of sales force forecasting, this method also entails some disadvantages. The accuracy of a sales force composite method depends to a high degree on the level of specific domain and product knowledge (Edmundson et al., 1988 quoted by...
Lawrence et al., 2006). Thereby it underlines the fact that the sales force should only contribute where they can make a significant contribution, i.e. where they have sufficient domain knowledge! Nikopolopus et al. (2005) point out that using sales force to correct instead of creating forecasts could increase the accuracy of forecast significantly. This again explains that using sales force is beneficial especially when changes in the market are happening so fast that the statistical data cannot foresee them.

**Market Research Tools for Judgmental Forecasting**

Figure 14 illustrates the information flow and different sources of information a company can use when generating organizational plans and forecasts (Makridakis et al., 1998). The sales forecast of the company is primarily based on external information such as national economy, customers, and competitors. But a sales forecast is also affected by marketing plans inside the company, e.g. promotional plans and pricing.

Hence, a sales forecast is considered as a contributor to the overall plan and decisions of the company. Nevertheless, there are additional internal factors such as production plans and financial plans, that influence and account for a company’s overall plans and decisions.

Information gathered through market research efforts can contribute and enhance the quality of judgmental forecasts. The advantage of judgmental forecasting is the ability to forecast changes in existing patterns. Hence, the input from individuals or groups of people with
special knowledge and expertise can be used to correctly modify existing trends. These decisions can further be enhanced through additional information gained through market research.

Mentzer and Moon (2004) stress the utilization of leading and/or simultaneous (coincident) indicators. Knowledge of the behavior in the economy is a valuable input when trying to forecast changes or turning points in a company’s product sales. Simultaneous indicators serve to prove that a change in trend, anticipated on the basis of leading indicators, is really happening.

Table 9 comprises Mentzer and Moon’s (2004) overview on common leading economic indicators.

<table>
<thead>
<tr>
<th>Common leading economic indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average work week</td>
</tr>
<tr>
<td>Durable goods orders</td>
</tr>
<tr>
<td>Plant and equipment purchases</td>
</tr>
<tr>
<td>Business population</td>
</tr>
<tr>
<td>Stock prices indices</td>
</tr>
<tr>
<td>Consumer spending</td>
</tr>
<tr>
<td>Construction contracts</td>
</tr>
<tr>
<td>Bond prices</td>
</tr>
<tr>
<td>Level and changes in business inventories</td>
</tr>
<tr>
<td>Growth in capital equipment industries</td>
</tr>
<tr>
<td>Capital appropriations</td>
</tr>
<tr>
<td>After-tax corporate profits</td>
</tr>
<tr>
<td>New manufacturing orders</td>
</tr>
<tr>
<td>Growth in durable goods industries</td>
</tr>
<tr>
<td>Level and changes in money supplies</td>
</tr>
</tbody>
</table>

Table 9: Economic Indicators, (Source: Mentzer and Moon, 2004: 165)

Obviously this list provides a comprehensive overview, therefore, to be effective a company has to decide which indicators are leading for its particular industry. As for leading indicators, Mentzer and Moon (2001) also give some examples of simultaneous indicators including: unemployment rate, index of industrial production, Gross Domestic Product, personal income, retail sales and index of wholesale prices. The information obtained through market research and indicators can be provided to experts, salespeople and sales managers - basically to anyone who is involved in the forecasting process.

**Accuracy of Judgmental Forecasting**

The accuracy of judgmental forecasts is, on average, inferior to statistical forecasting methods. Judgmental methods are subject to personnel biases and limitations. Hence, judgmental forecasting is highly dependent on the individual person making the forecast (Makridakis et al, 1998).
Mentzer and Moon (2004) identify two major sources of problems: the tendency for bias to be introduced into the forecasts and the fact that qualitative forecasting is relatively expensive.

The first problem occurs because of limitations on the forecasters’ abilities to acquire and process complex information without being influenced by factors other than those relevant to their decisions. Moreover, this problem is enhanced via the forecaster’s limited ability and/or lack of willingness to acquire information (ibid.). As a result, judgmental forecasts are often generated without considering all relevant information. Companies may reduce this source of bias by providing the relevant information and structuring complex data. The second problem is related to the fact that judgmental forecasts require a lot of managerial and analyst time to complete.

Makridakis et al. (1998) refer to another problem, which is salespeople’s overconfidence in their ability to produce accurate forecasts. Research has proven that confidence in a forecast and the accuracy of a forecast are not always related (Makridakis et al, 1998). To overcome this problem a company can require explanations or justifications when generating or adjusting forecasts. This could be enhanced through regular comparisons between actual demand and the forecast.

Moon and Mentzer (1999) identify situations related to the emergence of weaknesses of judgmental methods:

- Situations where sales quotas and forecasting are intermingled – possibly leading to game playing with forecast data and
- Situations where domain experts have an overly positive or negative expectations about the market development.

A study by Sanders and Manrodt (2003) tried to determine what kind of companies use judgmental forecasts as opposed to statistical forecasts. Results show that companies have a greater tendency for judgmental forecasting methods in situations when the markets are more uncertain and flexible, as well as when the company faces global competition. This could indicate that judgmental forecasting methods are superior when changes happen more rapid and discontinuous as opposed to a stable and continues market development, which sounds logically.

Lawrence et al. (2006) suggest and conclude, after 25 years of researching on the theoretical body of judgmental forecasting, that judgmental forecasting methods can be as good as the
best statistical methods. They also may have greater consistency in their accuracy, but this is not assured. This indicates that doing judgmental forecasting, such as a sales force composite, could be just as accurate as doing statistical forecasting. However, it is hard to make a general statement on the accuracy of qualitative forecasting. This is due to the fact that judgmental forecasting is highly reliant on individuals, compared to statistical forecasting that will always be unbiased and based upon solid data.

Judgmental Biases in forecasting

Makridakis et al. (1998) provide an extensive outline of common biases based on their cooperation and experiences with several case companies, research work and relevant findings in forecasting literature. In order to avoid such potential biases, it is of critical importance to any company to be aware and correctly cope with such issues.

Table 10 provides an overview of most common biases and describes ways to avoid or reduce their negative impact.

<table>
<thead>
<tr>
<th>Type of Bias</th>
<th>Description</th>
<th>Counter Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inconsistency</td>
<td>Unable to apply the same decision criteria in similar situations</td>
<td>• Formalize a decision-making process&lt;br&gt;• Create decision making rules</td>
</tr>
<tr>
<td>Conservatism</td>
<td>Unable to change (or rather slow) one’s own mind in light of new information</td>
<td>• Monitor changes in the environment and build process to take actions when changes identified</td>
</tr>
<tr>
<td>Regency</td>
<td>Prioritizing recent events, past events are downgraded or ignored</td>
<td>• Realize cycles and that not all ups or downs are permanent&lt;br&gt;• Consider fundamental factors that affect the event of interest</td>
</tr>
<tr>
<td>Availability</td>
<td>Relying upon specific events easily recalled from memory to the exclusion of the other pertinent information</td>
<td>• Present complete information&lt;br&gt;• Present all sides of situation / information considered</td>
</tr>
<tr>
<td>Anchoring</td>
<td>Being overly influenced by initial information which is given more weight in the forecasting process</td>
<td>• Start with objective information&lt;br&gt;• Discuss potential types of changes&lt;br&gt;• Reasoning propose changes</td>
</tr>
<tr>
<td>Illusory correlations</td>
<td>Believing that patterns are evident and/or that variables are causally related when they are not</td>
<td>• Verify statistical significance of patterns&lt;br&gt;• Model relationships, if possible, in terms of changes</td>
</tr>
<tr>
<td>Search for supportive evidence</td>
<td>Gathering facts that lead toward certain conclusions and disregarding others that threaten them</td>
<td>• Induce disconfirming evidence&lt;br&gt;• Introduce role of devil’s advocate</td>
</tr>
</tbody>
</table>

Please note that table 10 continues on the next page.
### 3. Theoretical Framework

<table>
<thead>
<tr>
<th>Type of Bias</th>
<th>Description</th>
<th>Counter Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression effects</td>
<td>Persistent in(de)creasing might be due to chance rather than a genuine trend</td>
<td>• Ask explanation if the errors are random, the apparent trend is unlikely to continue</td>
</tr>
<tr>
<td>Attribution of success and failure</td>
<td>Believing success is attributable to one’s skills while failure to bad luck, or someone else’s error. This inhibits learning as it does not allow recognition of one’s mistakes</td>
<td>• Donot punish mistakes, instead encourage people to accept their mistakes and make them public so they and others can learn to avoid similar mistakes in the future</td>
</tr>
<tr>
<td>Optimism, wishful thinking</td>
<td>People’s preferences for future outcomes affect their forecasts of such outcomes</td>
<td>• Have forecasts made by a disinterested third party • Have more than one person independently make the forecast</td>
</tr>
<tr>
<td>Underestimating uncertainty</td>
<td>Excessive optimism, illusory correlation, and the need to reduce anxiety result in underestimating future uncertainty</td>
<td>• Estimate uncertainty objectively. Consider many possible future events by asking different people to come up with unpredictable situations/events</td>
</tr>
<tr>
<td>Selective perception</td>
<td>Seeing problems in terms of one’s own background and experience</td>
<td>• Ask people with different backgrounds and experience to independently suggest solutions</td>
</tr>
</tbody>
</table>

Table 10: Common Biases in Forecasting, (Source: Makridakis et al., 1998: 500ff)

Another type of bias that frequently occurs throughout the preparation of a forecast is referred to as Game-playing. Game-playing occurs, when the forecasting contributor’s main objective is not to produce the most accurate forecast. This might appear bizarre, as forecasters should strive for high accuracy. In fact, there are situations where people either over-forecast or under-forecast. This usually stems from the belief that the forecasts and sales quotas are intermingled (Moon et al., 1999). This can result in situations where people under-forecast in order to easier achieve sales quota. This especially occurs when rewards or bonuses are interlinked with the achievement of the sales quota. Fildes (2003) explains that either people favor low forecasts in order to obtain a bonus, whilst other favor high forecasts in order to secure resource allocation.

Such game-playing usually takes place at both the bottom-up and top-town level of the forecasting process. Whereas sales staff tends to over-forecast, higher levels act more pessimistic leading to lower forecasts (Fildes et al., 2003). Game-playing is by nature an element that decreases the accuracy of the overall forecast, therefore, a bias issue that should be recognized and removed.

**Statistical Forecasting Methods**

Although the topic of this thesis lies on sales force forecasting, we believe it is valuable for this study, to mention the main statistical methods. As already stated earlier in this chapter,
forecasting accuracy can be enhanced through the integration of both: statistical and judgmental forecasts. Therefore, we provide a brief overview of considerable statistical methods, as well as highlight different ways to combine these with judgmental forecasts.

Statistical forecasting methods use historical quantitative data to make predictions about future developments. Consequently, the forecaster needs a great base of historical data that develops along a certain trend line. The advantage of statistical forecasting methods is that these are unbiased and use good as well as bad news in the same way. A statistical forecast is, however, only as good as the actual input data. Unlike judgmental methods, a statistical forecast cannot react to changes that are not evident in the historical data (Armstrong et al., 1998).

In the following we provide a brief overview of the most relevant quantitative forecasting methods, which we believe are of interest for this thesis.

Extrapolation
This quantitative forecasting method uses historical data on the series of interest (Armstrong and Brodie, 1999). Armstrong (2001b) characterizes extrapolation as a method that is: reliable, objective, inexpensive, quick, and easily automated. Consequently, this method is widely used, especially for inventory and production forecasts, operational planning and for long-term forecasts.

Rule-based forecasting
Traditional extrapolation methods enclose two major limitations: they do not incorporate existing knowledge that shows which extrapolation method is best in various conditions and they ignore managers’ knowledge about the situation.

Rule-based forecasting (RBF) is a type of expert system that addresses these issues by translating forecasting expertise into a set of rules (Armstrong, 2001: 257ff). The system uses judgment to develop and apply rules for combining extrapolations. As a result, RBF uses structured judgment to tailor extrapolation methods to situations. A series of studies done by Armstrong (2001) indicate that RBF improves the selection of forecasting methods, the structuring of time series and the assessment of prediction intervals.

Expert Systems
Armstrong (2001) describes expert systems as systems where an analyst tries to replicate the procedures an expert uses to make forecasts. These procedures, also referred to as rules, are typically created from expert protocols, describing what the expert is doing when making
forecasts, hence, based on knowledge about methods and the problem domain. Adya et al. (2001) suggest relying on a variety of sources such as textbooks, research papers, interviews, surveys and protocol analysis, in order to acquire knowledge for an expert system.

In fact, expert systems have similar characteristics to those of judgmental bootstrapping, rule-based forecasting and econometric methods (Armstrong, 2001). All of them utilize causal knowledge and tend to be highly structured. Nevertheless, there are some differences such as that judgmental bootstrapping tries to conclude the expert’s procedures, whereas expert systems strive to directly represent this process. Furthermore, rule-based forecasting only relates to time series, whilst expert systems are tailored primarily to cross-sectional data.

Econometric Methods

Econometric methods use prior knowledge and theory to construct a model. This method is based on theory, prior studies and domain knowledge, hence, the ideal way to incorporate expert judgment and quantitative information.

The main advantage of econometric models is that they can relate directly to planning and decision-making. Moreover, they provide a framework to examine the effects of marketing activity, as well as key aspects of the market and the environment, thus providing information for contingency planning. A drawback of this method is that it lacks in the ability to notice dynamic changes (Allen and Fildes, 2001: 303).

Generally spoken, quantitative forecasting techniques are more objective than their qualitative counterparts. Statistical forecasting methods are best suited to situations where historical data exists, and the past is considered a good indicator of what will happen in the future. By putting data in numerical form, it is possible to: maneuver the information in consistent and reproducible ways, combine figures, compare data, and examine rates of changes. Moreover, results can be presented in the form of tables, graphs and charts. This favors condition with people under severe time-shortage and information-overload. Beside these advantages, statistical methods also have some drawbacks such as the fact that not all variables, e.g. social and political factors, can be represented numerically. Furthermore, there is often a lack of good quality and sufficiently up-to-dated data.

Integration of Judgmental and Statistical Forecasting

One key finding in research conducted by Blattberg and Hoch (1990) is that judgmental and statistical methods used in forecasting have complementary strengths. As discussed earlier, statistical methods are hard to accomplish when past data is limited. This implies that they
have difficulties in handling special events or changes in the environment. Furthermore, complex statistical methods often lack in transparency and therefore credibility. On the other hand, statistical forecasting methods can make optimal use of vast quantities of data and handle these data consistently. Judgmental forecasts, however, are not consistent nor do these methods make optimal use of information. These and many other issues present a vital challenge raising the question on how to draw on the complementary strengths of both methods, whilst discarding their weaknesses.

Goodwin (2005) identified two main approaches to integrate both methods: judgmental adjustment of statistical forecasts, and mechanical integration.

The first approach should be applied when the forecaster has important extra information about events, which were not available in the statistical forecast (Goodwin, 2005). Armstrong and Collopy (1998: 4) support this condition and state three further conditions under which judgment should be integrated:

- There is judgment about what data are relevant to the forecasting task
- The judgment of forecasting experts can be used to determine the approach to be used
- The experts can incorporate domain knowledge into forecasts

The quality of such adjustments might be improved through the documentation of reasoning for adjustments. This helps others to understand the basis for the forecast, as well as reducing the tendency to make unjustified interventions. Furthermore, this enables the forecaster to learn from previous changes (Goodwin, 2000).

Goodwin’s (2005) second approach, i.e. mechanical integration, involves using a formula to combine judgmental forecasts with estimates of statistical methods. This can be done in different ways. Either the final forecast is simply a straightforward average of judgmental and statistical forecast, or the judgmental forecast is corrected for bias. The latter way compares a person’s past data of forecasts and the actual outcome. After that a fitting regression line to the data indicates the line of best fit, which can be used for future corrections.

Another categorization on how judgment and statistical methods can be integrated is done by Armstrong and Collopy (1998). Figure 15 illustrates five procedures that can be applied. The shaded boxes show the five integration procedures: revising judgment, combining forecasts, revising extrapolations, rule-based forecasting and econometric forecasting.
The right choice of an integration approach can have a substantial impact on the accuracy of forecasts. Therefore Armstrong and Collopy (1998) state certain conditions under which the integration of judgment and statistical methods should be considered:

- Statistical forecasts are available, i.e. quantitative data must be available and this must have some relevance for the future
- Judgmental inputs provide different information, i.e. judgments incorporate information that is not captured by the statistical forecast and vice versa
- Judgments are unbiased

If the above conditions are met, integration is expected to improve accuracy. Still the improvements depend on how well the judgmental inputs are structured, as well as that judgment is utilized as an input to the statistical method, rather than to revise their output (Armstrong and Collopy, 1998). In general the authors (ibid.) suggest equal-weight combining as the benchmark; this integration method is especially appropriate where series have high uncertainty or high stability. In case the historical data involves high uncertainty or high instability, revising judgment, revising extrapolations or combining is recommended. When good domain knowledge exists for both the future and the past rule-based forecasting or econometric methods are the best fit.
It seems apparent that no forecasting method is suitable for all situations. Nevertheless, evidence also proves that solely adding quantitative forecasts to qualitative reduces accuracy. Combining forecasts makes it possible to compensate the diverse deficiencies of applied methods. However, most companies utilize their forecasts in an informal approach and so fail to notice most of the benefits.

3.3.4 How to improve forecasting performance

As stated earlier, sales forecasting permeates all aspects of business operations. The seven key principles, presented at the beginning of this chapter, represent a guideline for sales forecasting management. In contrast to that, the following elements are benchmarks, which are necessary to achieve and improve the seven keys.

Moon and Mentzer et al. (1999) identify these elements:

1. Functional Integration
2. Approach
3. Systems
4. Performance Measurement

A company can be benchmarked upon each element. In order to determine a company’s level of development for each element Moon and Mentzer (1999) provide four stages a company can reach. Appendix 11.6 to 11.9 illustrates these stages for each element. The following section reveals what companies should do to improve their performance within each element.

**Functional Integration**

In order to effectively manage sales forecasting functional integration of a company’s forecasting functions, i.e. marketing, sales, production, finance, and logistics, is needed. This requires implementing what we already mentioned as forecasting CCC – communication, coordination, collaboration. The better the CCC, the more efficient and accurate forecasting becomes. Appendix 11.6 illustrates a summary of the characteristics enabling a company to determine which level of integration they reached.

A study conducted by Moon et al. (2003) demonstrates that a company may have a high degree of functional integration although having a separate function responsible for forecasting. However, due to the lack of a forecasting champion the company did not take advantage of this organizational strength (Moon et al., 2003).
In order to improve functional integration, hence achieve a higher forecasting performance, companies should (Moon and Mentzer, 1999):

- Recognize forecasting as a separate functional area, whose responsibility is to provide forecasts at levels and time horizons that are useful to marketing, sales, finance, production, and logistics.
- Encourage common goal setting through communication, coordination, and collaboration. As well as enable access to relevant information across functional areas.
- Provide performance rewards to all personnel involved in the forecasting process based on the impact of forecasting accuracy.

**Approach to Forecast**

The element of approach encompasses a company’s definition of a forecast and how a forecast is generated. There are two different approaches: either top-down decision making from the management level, or bottom-up forecasting involving sales people with domain knowledge. Some companies have a very top-down approach, and the forecasts become more focused on goal setting than actual demand forecasts. Companies should try and understand the link between the business plan and the forecasting, i.e. that forecasts acts as a basis for the business plan. Appendix 11.7 illustrates a summary of the characteristics enabling a company to determine which approach they have.

Actions that facilitate improvement in the approach to forecasting are (Moon and Mentzer, 1999):

- Obtain top management support for the forecasting- and business plan process.
- Reconcile forecasts and the business plan.
- Reconcile top-down and bottom-up forecasting.
- Train forecasting personnel in quantitative analysis / statistics and understanding of business environments.
- Incorporate and understand the forecasting “game playing” into the forecasting process.
- Segment out of the forecasting process key customers who can be forecasted separately.
- Segment products by their demand patterns, importance to the company, promotional importance, life cycle stage, shelf life, product value, customer service sensitivity, and raw material and production order cycles.
**Systems**

This element is related to the utilization of systems to handle vast amounts of data used for a forecast. Hence, this element encompasses the computer and electronic communication hardware and software used in sales forecasting. Issues like a centralized system are highlighted, thus impeding the possibility of islands of analysis. For this dimension it is important that the system secures that all functions have the possibility to maximize their CCC, and do not become an obstacle for it instead. The characteristics shown in Appendix 11.8 make it possible to determine which stage is reached. Companies seeking to improve the effectiveness of their forecasting systems should (Mentzer et al., 1999):

- Eliminate “islands of analysis” by moving to a client-server architecture that allows all functional areas involved in, or affected by, the forecast to have input to the process.
- Develop common ownership of databases and information systems.
- Provide the ability to obtain customized on-screen and printed reports on demand.
- Enfold key customers and suppliers into the forecasting information system to allow supply chain staged inventory based on point of sales demand forecast.

**Performance Measurement**

Performance measurement involves the metrics used to determine forecasting effectiveness and the information gathered to explain its performance. Especially forecasting effectiveness and accuracy must be constantly measured. This makes it possible to make adjustment and gives the contributor the chance to improve their forecasting skills for the future. An important note is that performance measurement must always be connected to the individual’s role in the forecast, and related to the different functions inside the company. Hence, employees in logistics should be measured differently than employees in sales.

The characteristics of the four stages are outlined in Appendix 11.9. In order to improve forecasting effectiveness companies should (Moon and Mentzer, 1999):

- Measure forecast accuracy at all levels relevant to the functional areas using the forecast.
- Use a measure of accuracy with which management is comfortable, but recognize that MAPE is the most popular of such accuracy.
- Provide both graphical and statistical measures of accuracy.
3. Theoretical Framework

- Provide a multidimensional metric of forecasting performance that also measures the impact of the forecast on profitability, competitive strategy, supply chain costs, and customer service.

These benchmarks provide clear steps within each element, aiming to move a company to a higher level of excellence in forecasting. A progression that is indicative of the learning organization, encouraging a company’s chance to lower inventory levels and supply chain costs, as well as higher customer service levels and moral.

3.4 Conclusion

Based on the previous described theory, we created an overall analytical framework for sales forecasting management. The framework provides the main guideline to organize and analyze the empirical findings of this study. The model is divided into four steps, representing the normative process of sales forecasting derived from the available theory. These four steps are: Knowledge creation, knowledge transformation, knowledge use and feedback.

3.4.1 Knowledge Creation

We defined knowledge creation as the process of converting domain knowledge into specific sales numbers or the extrapolation of historic sales numbers. This involves judgmental forecasting and statistical forecasting methods, as well as the integration of both methods. Areas of special interest are the forecasting climate, which should support and enhance accurate forecasting. Furthermore, the integration of the forecasting process, in a company’s daily routines, as well as motivation are integral elements in four-step process.

3.4.2 Knowledge Transformation

One of our key findings from existing theories is that forecasting and planning should never be intermingled as it may lead to several drawbacks in the forecasting accuracy. Therefore the second step, knowledge transformation, is the stage where forecasts become plans. Hence, areas of special interest are: the company’s distinction between forecasting and planning, forecast adjustments, the company’s internal environment / climate for forecasting, as well as the integration of forecasting into plans and systems.

3.4.3 Knowledge Use

At this step mainly two areas within a company are addressed: production planning and shipment requirements. These two areas are very dependent on accurate forecasts. Special attention is paid to the company’s lead times. Most companies attempt to deliver their goods as fast as possible. This requires a sound production planning, which in turn depends on
accurate sales forecasts. Hence, the third step within our framework places particular interest on three aspects: forecasting time frames, lead times and flexibility.

3.4.4 Feedback

As stated earlier in this chapter, feedback and measurement on forecasting accuracy are two crucial aspects within the forecasting process. This step covers aspects like communication, as well as information sharing throughout the whole forecasting process. Moreover, the aspect of training is highlighted. This includes both forecast contributors and users. As a result the feedback step of the framework focuses on: training, accuracy and performance measurement.

The four steps within our developed normative process are illustrated in Figure 16. The figure also shows the communication between the different steps, which is a crucial aspect to forecasting accuracy, too.

Figure 16: Overall Analytical Framework, (Source: own)
This chapter is concerned with presenting VCE Region International and its current forecasting practices. We will start by giving a presentation of VCE Region International, as well as its newly incorporated forecasting system. This is followed by an illustration of the forecasting process. Hence the main focus of this section is devoted to mapping the process itself, starting from the collection of data, through responsibilities to validation, reviews and evaluation. Additionally, we will look into aspects such as the transformation from a forecast into organizational plans, internal communication, and information flows. Finally, we will look into areas like performance measurement, forecasting accuracy, training and feedback.
4 Empirical Evidence

4.1 The Volvo Group

Volvo Construction Equipment Region International (VCE Region International) is part of the Swedish based Volvo Group. The Volvo Group consists of nine separate business areas, all in the field of transportation. These nine areas are: Volvo Trucks, Mack Trucks, Renault Trucks, Nissan Diesel, Volvo Buses, Volvo Construction Equipment, Volvo Penta, Volvo Aero and Volvo Financial Service. In the fiscal year of 2008, the Group had a total sales volume of approximately 304 billion SEK, and a profit of around 66 billion SEK (volvo.com). The Volvo group is a highly globalized company with sales in around 180 different countries and production facilities in 19 countries. The overall Group has around 100,000 employees around the world.

4.1.1 Volvo Construction Equipment

VCE is one of the oldest manufactures of construction equipment in the world. The history of VCE dates back to 1832 in Eskilstuna, where the company started to produce pressing machines in the mechanical workshop. VCE has been associated with the Volvo Group since 1985; and became a fully owned subsidiary in 1995. Through the last 175 years, VCE has evolved through innovation and acquisitions and is today in the top 3 of the construction equipment industry.

With an annual turnover of approximately USD 5.5 billion with profits of about USD 500 million, VCE represents the second biggest business area in the overall Volvo Group only surpassed by Volvo Trucks.

VCE has production plants on four continents located in Sweden, Germany, France, Korea, the United States, Canada and Brazil, India and China. As already stated in the methodology, for this thesis we put our focus on the Articulated Haulers. This product is one of VCE’s core products, ranking VCE among the top companies of the industry. The four models of the Articulated Haulers: A25E, A30E, A35E and A40E, are developed and produced in Braås, Sweden, Pederneiras, Brazil, as well as in Ashville covering the North American markets. These models can furthermore be bought with full suspension known as the FS models such as the A40E-FS.
Figure 17 illustrates how VCE divides its operating regions.

![VCE's Operating Regions]

Figure 17: VCE's Operating Regions, (Source: VCE Region International: Company Presentation, 2009)

The focus of this thesis is on VCE Region International. As Figure 17 illustrates, Region International represents the largest geographical region and is at the same time the fastest growing region in VCE. Region International is furthermore divided into six sub-regions: Latin America & Cuba, Africa, Russia, Ukraine & Belarus, Turkey & Central Asia, Middle East and Oceania. Appendix 11.11 provides a brief overview of each sub region, indicating the number of countries and Dealers, as well as the units sold in 2008.

**VCE Region International's Market Development**

As a result of the ongoing global financial crisis world markets are slowing down rapidly. Today, VCE is facing a weakening of the construction equipment market, which started in North America in 2008, and later spread to Europe and Asia becoming a global downturn. VCE’s total market (TM) development, as well as the impact of the global downturn can be clearly observed in Figure 18. This figure shows the total market development for General Purpose Equipment from 1997-2009 by Key Market Areas in Units.
The coinciding impact of bursting economic bubbles, together with the expected cyclical downturn of developed markets led to unprecedented turbulent markets, which are hard to predict and plan for.

VCE Region International is aware that they are in the middle of a business cycle downturn situation, which may cause weaker competitors to perish. VCE Region International’s plan for 2009 is to adjust to the current situation and ensure an intact distribution. According to the management’s estimation, VCE Region International is determined to come out stronger at the upturn of this crisis (VCE Region International: General Plan 2009). Figure 19 shows the correlation of VCE Region International’s TM development and GDP growth.

Figure 18: TM Development for General Purpose Equipment 1997-2009, (Source: VCE Region International: General Plan, 2009)

Figure 19: GDP Growth vs. Total Market Growth, (Source: VCE Region International: General Plan, 2009)
Market changes like illustrated in the previous figure, highlight the necessity of monitoring and keeping track on market development as well as business related indicators. Markets in the construction equipment industry fluctuate widely and therefore require a fairly flexible production.

4.1.2 VCE Region International’s Strategic Steps for Cyclical Downturns

In order to limit the negative effects of the current down-turn, VCE Region International deploys several strategic steps. One of these is Volvo’s Business Cycle Management, which makes it possible for the whole organization to have a common understanding of actions-to-take for 2009, as well as specifies focus-areas in a situation like they face today. Figure 20 indicates an overview of all four business cycles, i.e. downturn, bottom, upturn and peak, as well as the focus areas for each cycle. This down-turn management is well known and they are prepared to work on and realize each target.

<table>
<thead>
<tr>
<th>Focus area</th>
<th>Phase</th>
<th>Downturn</th>
<th>Bottom</th>
<th>Upturn</th>
<th>Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pricing and commercial development</td>
<td>Downturn</td>
<td>Mix/pricing (absolute contribution per vehicle)</td>
<td>Mix/pricing (absolute contribution per vehicle)</td>
<td>Develop soft products</td>
<td>Secure operating leverage</td>
</tr>
<tr>
<td></td>
<td>Bottom</td>
<td>Increase soft product penetration</td>
<td>Mitigate downturn implications with soft product offerings</td>
<td>R&amp;D focus on new products &amp; facelifts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upturn</td>
<td>Develop partner relationships</td>
<td></td>
<td>R&amp;D long term plan (0-10 years)</td>
<td>Solve bottlenecks</td>
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<tr>
<td></td>
<td>Peak</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial operations and production management</td>
<td>Downturn</td>
<td>Adjust industrial structure organization</td>
<td>Train people</td>
<td>Train people</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bottom</td>
<td>Flexibility in R&amp;D</td>
<td></td>
<td>Get rid of low performers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upturn</td>
<td>Recconsider sourcing &amp; contracting</td>
<td></td>
<td>Add temporary personnel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Peak</td>
<td>Keep core operations</td>
<td></td>
<td>Manage inflation</td>
<td></td>
</tr>
<tr>
<td>Human resources management</td>
<td>Downturn</td>
<td>Train people</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bottom</td>
<td>Reduce temporaries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upturn</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investments, acquisitions, and divestments</td>
<td>Downturn</td>
<td>Make strategic acquisitions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bottom</td>
<td>Make capacity investments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upturn</td>
<td>Make strategic acquisitions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Peak</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk management and operational excellence</td>
<td>Downturn</td>
<td>Restructure commercial &amp; Admin</td>
<td>Focus on cash flow</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bottom</td>
<td>Focus on cash flow</td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>Upturn</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Peak</td>
<td></td>
<td></td>
<td></td>
<td>Build Cash</td>
</tr>
</tbody>
</table>

Figure 20: VCE Region International’s Business Cycle Management, (Source: VCE Region International: General Plan, 2009)

Furthermore, VCE Region International defines Targets for Operational Development (TOD) every year.

VCE Region International creates five to ten TOD’s on a yearly basis, which represent different improvement projects for the whole organization. The General Plan for 2009 includes a TOD called “Optimization of the Monthly Rolling Forecast”. The background of this specific TOD was the initial implementation of a new forecasting system, as well as the awareness that the construction equipment market faces a downturn in the future, eventually
requiring superior forecasting process and practices. The objective for this specific TOD project is to put the focal point on inventory management and improved cash flow, by improving the monthly rolling forecasts without further development of the new forecasting system, i.e. SAP 4C.

4.1.3 SAP 4C System

VCE Region International has just incorporated a process and system for complete financial and volume forecast on a monthly basis. The main goal of this new system, namely SAP 4C, is to align financial forecasting and volume forecasting. SAP 4C is a web-based system designed to generate 12months-rolling forecasts. Due to the fact that VCE Region International operates with multiple SAP systems throughout the whole organization, the implementation of SAP 4C allows combining and integrating the forecasting process with those systems.

After updating the 4C with the new forecast volume, the user immediately has a picture of the total forecast for the next 12 months. Hence, the system allows a better communication and visualization between the forecasting contributors. Moreover, SAP 4C increases the transparency of the whole forecasting process. By entering the unit forecast the user gets feedback on financial forecast, stock levels and shipments.

How the system works

The SAP 4C “window”, to enter the forecasted numbers, opens three days at the beginning of every month. During that time, either the ASM or BC enters the forecasted numbers. To get an idea of how the system looks like, we created some screenshots from this system; these can be found in Appendix 11.12.

After starting the system, the user has to select the following: planning year: e.g. 2009, version: e.g. forecast 02 Feb – Jan, dealer: e.g. CJD Equipment, and product line: e.g. haulers.

After that, the user solely works with three tabs:

1. Parameters
   The stock parameters indicate the “month’s coverage”, i.e. how many months of stock coverage the Dealer wants to have, as well as the “opening retail stock”, i.e. the current stock level.

2. Retail Sales
   Here the forecasted numbers of the specific product group have to be added.
3. Closing Stock Retailable

The closing stock retailable shows the diverse models of the chosen product group and the numbers of units during the forecasted period, displaying in which month new shipments are needed in order to keep the stock on the chosen level.

This makes it possible to calculate backwards. To be exact, the calculation is based on the product lead-times, whereof the shipment demand is derived.

**Who updates the system**

At the current time only few ASMs are working directly with the system. This is partly due to the fact that not all markets of Region International have sufficient Internet connection and access to connect with the system. Examples of such markets are: South Africa and Middle East.

Another factor is that most of the ASMs are traveling throughout their markets, making it hard for them to have Internet access and enter their forecasts into the system. The rather short time-window, i.e. when the 4C system is officially open for the contributors to enter new data, enhances this problem. We also found out that some ASMs are reluctant to work with the new system. This is mainly due to the fact that they are solely working a few days each month with the system, making it hard to get to know and fully understand the system.

In that case, the ASMs fill out an excel file which they received before the “window” opens and forward this to their responsible BC. The BC then adds the figures to the system; this is done via copying the forecasted numbers into the SAP 4C system. The fact that the BCs only copy the numbers and add them to the system diminishes the possibility of errors through transferring (VPT, Interview).

ASMs from other markets like Russia and Turkey, where VCE Regional International has owned-Dealers, have direct access to the system and enter their forecasts themselves in the system.

Figure 21 illustrates the two ways the SAP 4C gets updated, i.e. either directly by the ASM, or by the BC who received the updated excel file from the ASM and copy/pastes the forecasted numbers into the system. The latter is the more common way.
Strengths & Weaknesses

In the course of our interviews, we discovered some strengths and weaknesses of the new forecasting system. However, these findings are very dependent on the user and differ from interviewee to interviewee. Nevertheless, we were able to summarize the most common strengths and weaknesses.

The overall opinion about the new system turns out to be quite positive. Most interviewees highlighted 4C’s strengths in aspects like visibility, updated information, overview of the total situation, easy data interchange and extraction to other systems, good reporting tools, the automatic calculation of shipment and production, and the combination of financial and volume forecast.

Nevertheless, regarding the use of the system opinions start to differ. Some ASMs emphasized difficulties in understanding the logic behind the system. They described it as too complex, meaning that many things are interconnected and it is often hard to reconstruct results. Furthermore, they mentioned that it is sometimes hard to keep a good overview during the working process. This is mainly due to the fact that the user has to work with different screens at the same time. Such hurdles raise the possibility of human errors (ASM, Interview).

Some BCs, on the contrary, stated that the 4C system is rather easy to use compared to the old forecasting system, i.e. MAIN. However, they also highlighted problems to understand the logic behind the system, i.e. How the system is built up.

Another mentioned weakness is that the system is often slow, leading to slow-going progress with a lot of clicking involved (BC, Interview). However, this weakness is mainly due to the fact that the system is a web-based tool, dependent on high-quality Internet connection.
Furthermore, one ASM stated the following:

“the system is not bulletproof (…) in the end you do not know who has ownership of each input or the changes”.

This person referred to the problem that the system does not track down changes to the numbers, such changes encounter in the course of the various review meetings involved in the current forecasting process. However, we will describe this concern in more detail later in this section.

A further drawback revealed, is the format of the system, meaning that 4C does not provide any historical numbers from previous forecast. Hence, the system solely looks forward (ASM, Interview). Compared to that, the previous forecasting system was perceived as more complete as it allowed the forecaster to use previous numbers and figures.

However, all interviewees are agreeing in the fact that most of the current drawbacks are a consequence of their low experience and knowledge about the system. Hence, everybody has to get familiar with the new process and system (BC & ASM, Interview).

Today the system is still in the introduction stage, however, one interviewee expressed expectations for the coming months/years in a nice way:

“once the system is completely set up and business is back to normal market conditions, it will be a helpful tool” (VP Sales Region International, Interview).

When the system, as well as its users, is fully integrated, sales forecasting will be a more routine process at VCE Region International, than at the moment.

4.1.1 Other Supportive Tools & Systems

VCE Region International’s current forecasting practices demand numerous systems and tools. These diverse systems facilitate the combination of the available information and data, necessary to generate a forecast.

In the course of our research we got a clear picture about common used programs related to the forecasting process. This section provides an overview of these tools and systems.

MOM

The Master Order Management system is a fairly new integrated machine order system, also based on SAP. Depending on VCE Region International’s sub-regions, the Dealers have
direct access to the system via the Volvo Dealer Network, or forward their order to market support at the regional sales office located in Eskilstuna, Sweden. The factory-side is also connected to this system, which has to confirm the order. During our interviews, this system was characterized as a rather complex sub-system involved in the forecasting process.

**MAIN**

The MAIN system is the old forecasting system, which is currently in the process of being fully replaced by other systems such as the SAP 4C system. At the current time, MAIN is still used to administer the actual sales. For that reason, tasks like sales reporting and the total market forecast are still based upon MAIN.

**Qlikview**

Qlikview is the main analysis tool available for all contributors within the forecasting process in Region Europe and Region International. The analyzed information can be visualized in tables, graphs and charts, and used for creation of reports.

The system is interlinked with the MAIN system, and uses the actual sales numbers to compare them to the forecast. This analysis can be broken down into sub-regions and individual Dealers. Since the MAIN system is going to be replaced by the new 4C system, VCE Region International will interlink Qlikview and 4C.

**Reuter’s EcoWin System**

The EcoWin system is a special tool solely available for the VPT at VCE Region International. The main application of this system is to identify macroeconomic indicators used to create VCE Region International’s total market forecast. All in all, the system consists of two parts: a database for macroeconomic data series and a statistical feature. The statistical feature allows some processing on the figures in different ways, and does statistical analysis on figures of a certain product. These two parts enable the user to find correlations between different key indicators and historical sales.

Apart from all the business intelligence provided by VCE Region International’s back-office, these four programs are the main systems we came across when studying the sales forecasting process. Important to note is that whereas MOM and MAIN are administrative systems, Qlikview and EcoWin are more for informative practices.
4.2 Mapping the forecasting process at VCE Region International

In this section we will present and illustrate how the current forecasting process at VCE Regional International works. This is done by identifying and describing the various steps of the process, as well as by highlighting the involved stakeholders and their responsibilities within the process.

At this stage it is important to note that the following pages will contain many abbreviations, and we recommend taking a look at the list of abbreviations on page vii before reading.

4.2.1 The Process

Due to the fact the VCE Region International just incorporated the new forecasting system SAP 4C, and hence changed from generating their forecasts three-times a year to a 12month rolling forecast process, the whole organization is going through big changes. Consequently, VCE Region International is starting to gain experience and insight to handle the new system and procedures. At the current time the whole organization is still learning, often encountering new hurdles. However, this learning-process takes places in any company with any new system. A couple of years ago VCE Region International introduced a new order system called Master Order Management. This system is also SAP based, and it took as well some years to develop a smooth procedure.

One of our interviewees described the situation today as the following:

“The prevailing integration processes, as well as the abnormal market conditions cause some early errors, which will hopefully disappear in the cause of time.” (VP, Interview).

We have tried to filter away this noise in our data and really focus on the total process of forecasting for this thesis. In order to understand the underlying practices of VCE Region International’s sales forecasting procedures, we describe the entire process. This outline is based on our findings from several interviews and internal data from VCE Region International. There are small differences in the perception of the process among the interviewees. These differences are mainly due to the different markets which contributors operate in. However, we put focus on the main steps in order to provide an illustration of the basic process. Dissimilarities are highlighted within the explanation of each step.

Figure 22 shows the eight steps in VCE Region International’s forecasting process.
Step 1 – Total Market Facts & Figures
The whole process starts with an analysis of the latest “Early Warning Indicators Report” (EWI-Report). This report is released two to three times a year from the Volume Planning Team (VPT). Therefore the VPT uses Reuters EcoWin database, an online system that generates figures and charts of macroeconomic data.

The purpose of this information exchange is to provide an insight into the total market situation. This information, among others, can then be used to form the base for the discussion between ASMs and Dealers in order to create their forecast. Appendix 11.13 shows an abridged version of the EWI-Report for Australia.

Step 2 – VPT distributes Forecasting Template
In the next step, the VPT creates an excel file template, indicating the forecast of the previous month. This template consists of the following information:

- Actual Sales from 2008, i.e. all sales of a certain model within 2008
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- Year To Date Sales (YTD) 2009, i.e. all sales of a certain model from January 2009 until the current month
- Retail Orders on Hand (Retail OOH) 2009, i.e. all end-customer orders that the Dealer currently has
- F03 Mar, i.e. forecasted units from March this year
- The following months, e.g. Apr, May … where the user has to enter the forecasted units
- R12 F04, i.e. sum of forecasted units from April (= F04) until April next year
- Full Year 2009, i.e. sum of forecasted units within 2009

The purpose of this information exchange is to provide the Dealers and ASMs an insight into the status-quo, and to add the forecasted units for the following 12 months. Appendix 11.14 is an illustrative example of such a file.

**Step 3 – Raw Forecast is Created**

Step three is related to the actual generation of the forecast. Usually, the ASMs create the forecast in collaboration with their Dealers. This way of creating the forecast is supported by weekly meetings between ASMs and Dealers on a sub-regional level. The accomplishment of these meetings differs from region to region. Furthermore, there are official Dealer Business Meetings with ASMs and Dealers. This meeting is held once a year for small Dealers and up to three times for big Dealers. The purpose of this meeting is to discuss the current market situation, as well as the development and the status quo. In alignment with that information, as well as other sources, ASMs and Dealers create their forecast once a month for the coming 12-month period.

**Step 4 – Input into 4C**

The actual input of the forecasted units is currently done in two ways. The first, and common, way is that the ASM forwards the updated excel file containing forecasted numbers to the responsible BC in Eskilstuna, Sweden. This is usually done a few days before the system opens. Normally there are no adjustments or corrections of the forecasted numbers at this stage. However, depending on the BC, there might be a comparison of the new forecast with previous forecasts, as well as a check on the stock-level and shipments in order to avoid too unrealistic numbers. Then, the BC enters the numbers into SAP 4C.
The second way of putting the forecasted numbers into system is that Volvo-owned Dealers, as well as ASMs located in Eskilstuna, work directly with the system and enter the forecasted units themselves into the system.

Today, this step is mostly on the responsibility of the BC’s. However, one of VCE Region International’s targets is to move this responsibility totally to ASMs and Volvo-owned Dealers.

**Step 5 – First Review of the Forecast**

After all sub-regions entered the forecast into the system, the first review meeting takes place. A couple of interviewees termed this meeting as a “sanity check” for the forecast.

This meeting involves the VP of the sub-region, as well as the responsible BC for the sub-region and the ASMs. Basis for this meeting is the compounded forecast of all regions. The aim of this discussion-round is to examine feasibility, reasonability and validity of the numbers. If necessary, adjustments are made on a sub-regional level. These adjustments are mainly based on their experience and a holistic view of the world market development. At the current time, numbers are mainly downsized. After that meeting the responsible BC updates the numbers in the system.

**Step 6 – Second Review of the Forecast**

After the first sanity-check of all sub-regions, the next review meeting at a higher level takes place. This meeting involves the VP of Sales, the VP’s of the sub-regions and the VPT. Again, the combined sales forecasts are discussed and validated. If necessary, adjustments are made and the system is updated accordingly. These changes are mainly based on the combined experience and gut feeling of the group. This takes place within the last day the 4C system is officially “open” for changes of the forecasts.

**Step 7 – Alignment with Production**

After the official input-period to update the system with the forecast, the so-called Demand Review Meeting takes place. This meeting involves the President of Region International, VP of Sales, the VPT, the Commercial Management which consists of a representative of the Brussels’ HQ, as well as the S&OP Leader of every product group.

This meeting starts with a detailed update on VCE Region International’s sub-regions and markets, as well as stock levels, shipments, incoming deals and the development of key-indicators. After that, each S&OP Leader presents the current sales-figures, the accuracy of
4. Empirical Evidence

the previous forecasts, inventory levels and forthcoming shipments. This is then followed by a discussion of the last forecast. Generally speaking, this is a constructive discussion, with an objective look at the current figures and numbers by matching them to the current status quo. This discussion ends with an agreement on necessary adjustments. Again, experience and previous sales play an important role for doing the adjustments.

Consequently new levels of forecasted demand are set. This updated forecast is then forwarded to the different production plants, which then start with the integration of the forecast into actual production plans. A detailed description of the actual integration is provided in section 4.4 Knowledge Transformation.

After updating the factory production system with new numbers, appraising production capacities and creating concrete production plans, the factory-side returns the confirmation of producible units. As soon as the confirmation is sent, the genuine forecasting process is finished. In total one loop takes between two and three weeks, starting with the generation of the forecast from the ASMs and ending with the confirmation from S&OP Leaders.

**Step 8 – Feedback**

The last step within the forecasting process is the feedback. So far, there is no formal procedure that takes care of the regular feedback. Usually, the ASMs get informed about changes of the forecasts. However, this is primarily illustrated in the final confirmation sent by the production site. This confirmation indicates the number of units they will receive, often quite different from the numbers they forecasted.

There is no feedback on the history of forecasting accuracy, and also no evaluation of the forecasting in a systematic way. However, the BCs and some ASMs have access to previous forecasts and it is likely that they somehow evaluate their performance in some way. This is different at the management level. Here, the VP’s of each region generate a feedback-report. This report indicates the short-term forecast, actual sales numbers and the budget. According to that, the VP’s can make a benchmark of the forecast to the budget and sales. Depending on the VP, this information is also shared and discussed with the ASMs. Appendix 11.16 shows an abridged version of such a Key Performance Indicator Report generated for the Middle East.

Figure 23 on the next page illustrates progress within the functions related to the forecasting process.
We believe that Figure 22 and Figure 23 give the best impression of the current sales forecasting process at VCE Region International.

After mapping the forecasting process, identifying and describing each of the steps involved, we are now describing VCE Region International’s forecasting practices in more detail. Therefore, we utilize the four stages of our analytical framework. In the course of that, we aim to create a better alignment between the empirical chapter and analytical chapter of this thesis.
4.3 Knowledge Creation

Within this section we aim to provide the reader an insight into the different sources of information used by the contributors of the forecasting process. This information is the base for the generated sales forecast. The information needed to create a forecast is very large, and there are a lot of indicators that need to be taken into consideration. In fact, many of the factors are interconnected and it is not always clear how changes of these indicators affect each other. However, in general terms we identified the major contributors that account for the creation of the sales forecast. The subsequent section describes these contributors and discusses how they gather necessary information.

Figure 24 shows the relevant steps for the knowledge creation stage derived from the developed 8-step-forecasting process model.

![Figure 24: Forecasting Steps contained in Knowledge Creation, (Source: own)](image)

4.3.1 Contributors

During our research we identified various contributors within the forecasting process. In this section we focus on those stakeholders that provide the actual information that is necessary to create the forecast. This information can be separated into primary or secondary data. Subsequent Figure 25 on the next page illustrates how we perceive this process.
The contributors that identify, generate and have access to various sources of information are the following: ASMs, Dealers, the VPT, VCE Headquarter, and Customers.

**Area Sales Managers**

The ASMs, together with Dealers, are responsible for the generation of the forecast. Therefore, the contributors act as supportive informants in the knowledge creation stage, trying to cover all required data that is valuable for the forecast.

Depending on the number of countries, each of VCE Region International’s sub-regions has at least one ASM responsible for one or more markets. Forecasting is one of many tasks that need to be done by the ASM each month. The quantity and quality on information available is highly dependent on markets. This is related to the development and maturity of the different sub-regions. Almost all of our interviewees highlighted this problem, so that a common set of sources of information is hard to derive.

**Sources of knowledge**

In order to create a realistic forecast, the ASMs are reliant upon many sources of information. In fact, the ASMs are very involved in this information gathering. Hence they are not only responsible for the generation of the forecast, but also doing a lot of research themselves. Again, this varies between the ASMs as the availability of information differs within the markets.

Each ASM has an individual set of input available. However, the following listing summarizes most of the types of data and sources involved in the ASMs information gathering process:

**Sources of Knowledge**

- Dealers
- VCE Region International’s Historical Sales Numbers & Experience
- External Sales Statistics
- Macro Economic Data
4. Empirical Evidence

- Dealers
There is no systematic way of gathering information from the Dealers. In general, the ASMs have weekly informal meetings with their sales force to discuss and analyze the current market situation. These informal meetings usually concern: Orders on Hand, near-term projects within or outside the country, business climate, as well as customer- and competitor specific information.

- VCE Region International’s Historical Sales numbers and Experience
Most of our interviewees stated that historical sales numbers are of high value. In fact, all ASMs have the possibility to look at previous forecasts and statistics. This historical information can be used to identify specific patterns within a season. One specific tool available for all ASMs is Qlikview. This is an intra-organizational system available for VCE Region International and Region Europe that allows looking at historical figures. Based on that historical information and their experience, ASMs are able to create their forecast.

- External Sales Statistics
ASMs may also look into external sources of information, such as country specific statistics. The Comesa Statistical Database is a comprehensive information system that looks at the development of specific countries. Such statistics may include information on the total market by month, industry, company, size, product groups etc. Another valuable source is the World Bank database.

- Macroeconomic data
Different kind of macroeconomic data is also gathered. This collection is done internally in each sub-region. Typical examples for such data are for instance political-, and economic information about macroeconomic development of the country. Another essential source is information on governmental actions like upcoming industry related funds for investments, projects, supplementary allowances, and sales tenders are also essential sources of information. Moreover industry related parameters such as building permits, new home sales, housing starts, general trends in the construction industry, and industry-specific projects may be investigated.

- Internal Factors
Internal factors may also affect or influence the forecast generation. Therefore, VCE Region International’s ASMs consider factors like promotional campaigns, the launch of
new models, as well as price changes in their forecast generation. Changes of such internal factors are discussed with the Dealers and incorporated in the forecasts.

The information gathered by ASMs and Dealers, is based on both the business environment and the industry environment. In general, most of the information is gathered from different sources, such as local newspapers, daily business press, weekly business magazines, governmental bulletins, economic journals, TV, and the Internet.

There is no systematic way or guideline for ASMs and Dealers specifying how they should create their forecast and which specific information to use. Depending on the ASMs experience, time and motivation, we recognized different magnitudes of desk research and field research. In fact, it is up to the ASM to discover certain indicators in their markets that give a realistic direction to prospective sales. These indicators, in a perfect world, should support the creation of a reliable and feasible forecast.

However, by the end of the day, it is up to the ASM, which sources to work with and include in the forecast generation process.

**Dealers**

The next major contributors are the Dealers. We already mentioned the Dealers as one of the ASMs many sources of information. Here we aim to describe why VCE Region International is so dependent on its local sales force.

One of the interviewees identified the role of Dealers in a nice way:

“they are the ones who are sitting on the valuable information” (VP, Interview).

This statement is an essential note that highlights the importance of the domain knowledge VCE Region International’s Dealers and sales force have. Fact is that the Dealers are the ones who are in direct contact with end-customers and other networks within their markets. This enables them to use this knowledge as foundation for the ASMs forecast. Such domain knowledge may consist of information about government legislation, big orders, end-customers, political changes and market development. For that reason, Dealers represent one of the fundamental contributors to the creation of the forecast.

However, a Dealers’ job and goal is to sell as many machines as possible. Therefore, it is natural that they are rather positive and search for sales opportunities, often leading to overly optimistic demand projections. Therefore, ASMs treat the Dealers’ information with caution
and skepticism. Most of VCE Region International’s Dealers are independent Dealers, with their own habits and tools to look at the market development. Therefore, it is hard to specify whether they utilize any forecasting methods or solely trust their experience and instinct. However, according to the conducted interviews most ASMs believe that their Dealers stick to their instincts and experience. In order to avoid too optimistic forecasts, ASMs and Dealers foster continuous contact via email, telephone or weekly informal meetings to discuss the status-quo of the business situation.

Figure 26 shows the diverse sources that compose the Dealers’ domain knowledge.

![Figure 26: Domain Knowledge, (Source: own)](image)

**Volume Planning Team**

The VPT consists of one business intelligence analyst that pays special attention to the total market development. In addition there are two more persons who are mostly involved in the VCE Region International’s volume planning. The VPT, also often referred to as a back office in our interviews, gathers and evaluates different kind of information.

In order to relate internal factors with external data, a compilation of the sales’ status quo is necessary. The so-called *Flash Report* serves as an update tool, which makes it possible to have a weekly review on sales. This set of information functions as base for the integration of external data. Such external data focuses on macroeconomic data, for instance mining and mineral production, civil engineering output, confidence index, industrial production and so on. As already stated, the VPT covers both internal and external information. However, emphasis is put upon external data. This includes both unpredictable factors and macro trends. Therefore local business press and the Internet are essential sources of information.

In general we identified two major steps the VPT applies to identify macroeconomic changes:
The analysis of the current performance of VCE Region International and total market. Therefore the VPT identifies *Early Warning Indicators* that are related to the company, industry and economy. This information is developed to match historical patterns with the current development, aiming to be aware of and evaluate necessary adjustments of markets/or products.

The analysis of historical trends and cycles, utilized to identify the position of VCE Region International’s markets and products within the standard business cycle. This analysis aims to look forward to future developments.

Furthermore, the VPT provides the ASMs with business intelligence such as the current total market sales and total market shares. This information may be used by ASMs to evaluate prospect orders.

As already described in Step 1 of VCE Region International’s current forecasting process, the VPT creates an *Early Warning Indicators Report* a few times a year. The tool used for this report is the EcoWin system, which generates figures based on Reuters’ database. The system correlates VCE Region International’s development with the current market development, aiming to identify indicators that may be useful information that signals future development.

**Indicators**

The identification of leading indicators for the construction equipment industry is no easy task, requiring a lot of experience and knowledge about the business and correlated external factors. The main and consistent problem with most indicators is their correctness in the course of time. An indicator that is valid for one day might turn without warning, and is suddenly no longer useful.

Most of the respondents in the conducted interviews highlighted the difficulty to manually discover leading indicators for their markets. Some of the mentioned indicators are: commodities, raw material price, diamond price, oil price, and mineral price.

To facilitate this identification process VCE Region International makes use of an online system called EcoWin. The main purpose of this system is to identify and analyze relations between multitudes of macroeconomic indicators that might be of importance for VCE Region International. The VPT examines this data and assembles an *Early Warning Indicator Report* for each sub-region. This report gives a summary on the total market development for each sub-region, specified for all product groups. The indicators and trends are visualized via charts and figures, as well as followed by an explanation of their impact on VCE Region...
International’s business. Appendix 11.13 is an abridged version of the EWI-Report created for the Australian market. As this example shows, such a report may identify indicators for: wheel loaders, excavators, backhoe loaders, articulated haulers, graders, and compact excavators. The identified indicators are: composite leading indicators, unemployment rate, wholesale inventories, interest rates, approved dwellings.

This report is then forwarded to the ASMs and also discussed within meetings.

**VCE Headquarter**

VCE’s Headquarter, located in Brussels, mainly provides macroeconomic and competitor information to the other contributors in the forecasting process. This information is developed for VCE Region International’s major markets, as well as for groupings of several countries in regions with smaller markets, like the Middle East. However, this source of knowledge is mainly used by the management-level as basis for discussions and the validation of the forecasts during the review-meetings.

**Customers**

Regular customer visits are tasks that are done by each sub-region’s ASM. This continuous contact facilitates better understanding of customer-needs and planned purchases, i.e. a highly valuable information for generating their forecasts. Depending on the region and ASM, this task is also done by local Dealers who then reports to the ASM.

### 4.3.2 Forecasting Methods

This section discusses the different methods applied by ASMs to create a forecast. At the moment there is no standard method or procedure for generating forecasts. Hence, the different contributors within the forecasting process utilize different methods for creating forecast.

**Judgmental & Statistical Forecasting**

In the case of VCE Region International, the most used method is by far judgmental forecasting. This is a method of forecasting that utilizes domain knowledge to forecast future sales. The ASMs of VCE Region International have a high degree of domain knowledge, plus the knowledge they can obtain from their dealers. One should note that the countries in Region International are very different and so are the methods of forecasting for the different ASMs. ASMs with rather small markets tend to have more control over the forecast than ASM’s in bigger markets. This might be due to the availability of domain knowledge, which is definitely lower in the smaller markets.
For bigger markets, the forecast is most often derived through a dialogue between the ASM’s and Dealers every month. The Dealers provide the ASMs with information through the Dealer Business Meetings.

In fact, ASMs use a combination of statistical and judgmental methods. On the one hand they base their forecasts on macroeconomic data. However, ASMs put greater emphasis on local newspapers and their domain knowledge. And on the other hand, they also use historical sales statistics to discover trends and patterns for their markets. Nevertheless, ASMs only use sales statistics and do not create statistical forecasts themselves.

VCE Regional International’s management level mainly utilizes information about government intentions, economic trends and political risks. Such information is identified via local newspapers and business magazines, TV and the Internet. This information is the basis for discussion-meetings with ASMs, mostly used when different opinions of market development are prevalent. Although there is no clear structure, or systematic way behind the managements approach, this can be classified as judgmental method.

We have not observed any statistical methods used for forecasting in our research, at least not any of the traditional used methods. However, the VPT is looking for connections between different macroeconomic indicators and the demand of their products. Therefore programs like EcoWin and other databases from governmental institutions are used to identify indicators such as composite leading indicators, interest rates, and inflation rates. These indicators are used to compare a product’s sales statistics with the behavior of indicators. If historical patterns are identified, the macroeconomic indicator is utilized for this product. The VPT itself does not deploy any mathematical models, rather the system itself. Therefore, this might be distinguished as statistical method or tool.

The next figure shows VCE Region International’s current forecasting practices, which are predominantly dominated by judgmental forecasting.
4.3.3 Personnel Biases & Game-Playing

One of the major drawbacks of judgmental forecasting are the issues related to bias. We divided this issue into two groups: personnel bias and game playing. Such drawbacks are by nature hard to discover, this is mainly due to delicate signs that indicate them. However, in the course of our interviews we discovered some symptoms for both groupings.

**Optimism and Wishful Thinking**

One characteristic mentioned by many interviewees is how Dealers, but also the ASMs, tend to over-forecast. As explained in one of our interviews, this is due to the nature of sales people. As matter of fact, a sales person’s aim is to sell as many units as possible, trying to boost their sales volume. Therefore Dealers are often over optimistic, which as a rule leads to over-forecasting. This issue is supported by the lack of forecasting training and rules or guidelines, leaving the Dealers and ASMs with no real tool for evaluating the feasibility of their forecasts.

**Inconsistency**

This bias is partly a result of VCE Region International’s business environment, which is by nature dominated by dynamic and fast changing market conditions. Appendix 11.17 shows the fluctuations of the markets Oceania and Turkey. Hence one can already see the difference between Oceania, i.e. VCE Region International’s sub-region that is comparable to Western markets, and Turkey, i.e. a more emerging market.

As a result, it is normal that orders are placed every now and then. This lack of consistency might affect the forecasters’ ability to do exact forecasts, making him/her perceive a more positive or negative future. Most of our interviewees also highlighted a common problem:
“the Dealers put too much emphasis on current events and orders-on-hand, instead of having a longer perspective”.

Such issues lead to a high inconsistency in how Dealers and ASMs forecast their markets.

**Bias of History**

This bias is mainly a consequence of VCE Region International’s failure to meet requested demand. Of course, this is none of the problems VCE Region International is facing today, but still affects VCE Region International’s forecasters. Not too many months ago, VCE Region International faced a major capacity problem – not being able to produce requested units. On the one hand customers were affected, but also VCE Region International’s Dealers suffered from long lead-times. During our interviews this situation was often described as “combat for machines”. In order to be on the safe-side and receive enough units, over-forecasting appeared. This situation was further enhanced through VCE Region International’s prioritization strategy, i.e. giving European markets and North American markets superiority. As a result, Region International was more seriously hit by long lead-times.

Although VCE Region International is experiencing rather the opposite of this situation at the moment, the experience of that time is still evident in Dealers’ and ASMs’ minds. Sooner or later, when VCE Region International’s markets start to prosper this shortcoming might emerge previous forecasting practices.

**Game-Playing**

We have only partly discovered an indication of game-playing. In fact, as we noticed it, game-playing could mainly be connected to the different incentive systems VCE Region International deploys. In general, VCE Region International does not link the salary with performance. In this respect, the forecasting process is not affected by achieving sales goals, market shares or a certain margin. However, this is not correct for the Dealers level, which is based on reaching prior set sales targets. This could cause a side effect: The Dealers’ sales personnel could intentionally set lower sales targets in order to reach those targets more easily and obtain their bonuses.

**4.3.4 VCE Region International’s perception on forecasting**

As we have learned from our interviews, VCE Region International’s attitude towards forecasting is much more important today, than it was before the financial crisis. The
contributors within the process realize now that forecasting is more than just a wide guess. One of our interviewees described the current sight on forecasting as the following:

“Although it might be hard to foresee and determine the market development for the coming year, people realize the value of observing and identifying market turns and trend shifts” (VP, Interview).

In fact, the whole perception of forecasting changed in the course of the crisis. Before, VCE Region International struggled with capacity restraints and ASMs and Dealers had problems with their product delivery. Today, the world looks different: ASMs and Dealers, as well as the factory site, have an oversupply of machines. This situation ties capital to inventories, making ASMs and Dealers incapable to pay their liabilities to VCE Region International.

“Before the crisis, the degree of importance and motivation was obviously too low, people were too optimistic, (…) people have been carried away. That is why they are sitting on their units today!” (VPT, Interview).

So far, this situation caused many bankruptcies. In order to prevent further drawbacks, VCE Region International puts heavy focus on downsizing their inventory levels and accurate sales forecasting.

Most of our interviewees also agreed that:

“there is a need for more control over the forecasting process, so people do not have the possibility to run wild, like some years ago!” (ASM, Interview).

This agrees with the request for measurement:

“to improve things, things need to be measured (…). So far there is no structured way of forecasting accuracy, which would also help to give better feedback and make people conscious about the accuracy and importance of their forecasts!” (VP, Interview).

Almost all of our interviewees stated that they put more attention to the forecast creation, trying to make as reasonable forecasts as possible.

One interviewee made it clear that:

“everybody learned her/his lesson from the last year, and now they start to realize the importance of correct statements” (VP Sales Region International, Interview).
However, people at VCE Region International are also aware that it is not an easy task, and hardly possible, to make 100% accurate forecasts. Consequently, they pay a lot of respect, as well as have high motivation in favor of forecasting.
4.4 Knowledge Transformation

Knowledge transformation mainly deals with the aspect of integrating sales forecasts into future production plans. Moreover, we discuss and describe one more aspect evolving at this stage: the communication, collaboration and cooperation between diverse contributors.

In fact, knowledge transformation concerns the transition from the created forecast into production plan. This transition is part of step 7 illustrated in the forecasting process. However, we also recognize step 5 and 6, which contain the two key review meetings, as components of the transformation process. Figure 28 shows these relevant steps for the knowledge transformation stage derived from the developed 8-step-forecasting process model.

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**Figure 28: Forecasting Steps contained in Knowledge Transformation, (Source: own)**

As shown by the 8-steps model on page 80 Figure 23: VCE Region International’s Stakeholders in the Forecasting, the forecast moves after its creation on to the region-level, passing through the two validation- and review meetings. Step 6 can be perceived as the consolidation of the bottom-up forecast, created by the ASMs and Dealers, and the top-down forecast, i.e. estimates and expectations of the market development from the management level. Here it is important to note that the forecast is solely assessed and revised by the judgment of the management level, but they do not go all over the forecast in details as well as do not create a new forecast as such!

Subsequently the revised forecast is forwarded to the S&OP level, which transforms and integrates the forecast into factory production plans. The interviewed S&OP Leaders from the production level described this as:

“the sales region hands over their demand projection to the product companies, who then start the actual production planning (…)” (Production Planner, Interview).
This progression starts with an examination of the production system, evaluating the current production capacities for the projected units. Moreover, this involves a verification of the availability of each product for forecasted months.

There are various factors that need to be taken into consideration, such as trying to create a fairly even built-rate. In the current environment VCE Region International also places a high focus on reducing inventory levels, especially at those of their Dealers. The main reason for that is to assist the Dealers to endure the current financial crisis, and avoid bankruptcy. Another reason is to move the current units in stock to other regions of the world where they are needed. Such unit reallocations are, of course, easier done from factory stocks than from Dealer stocks. This is further enhanced by the fact that necessary adjustments on the machines for another market, than it was produced for, can be directly done at the factory-site.

The S&OP Leaders’ integration of the forecasts with their production capacity planning is observed as an ongoing dialogue with both sides: sales- and factory side. For that purpose, VCE Region International’s sales-side and factory-side get together for the Demand Projection Review Meeting. As already described earlier, this meeting usually involves some changes and adjustments of the forecasted numbers and the ultimate goal is to agree and find a balanced level of units. The internal sales- and operation-planning process results then in specific production capacity plans.

4.4.1 Communication, Cooperation, Collaboration

VCE Region International’s communication practices can be typified as linear and direct communication.

Beginning from the market level, Dealers do not often communicate with VCE Region International’s management level. They have no access to most of VCE Region International’s databases, so the existing communication is mostly handled through the ASMs. This is the same for the communication between Dealers and the production level, again the only connection are the responsible ASMs who then forward information of verified orders.

Apart from informal meetings between ASMs and Dealers, VCE Region International introduced weekly Flash Reports. This report is sent out from the back-office, i.e. VPT. The purpose is to up-date the back-office about placed orders and retailed machines on a weekly basis.
The whole process starts with the extraction of the current status of orders from the MOM system, indicating the whole pipeline of machines that the Dealers have. Market support then adds the expected date of delivery from port and expected date of arrival to destination port, as well as the machine ordering status from the MAS system. The updated file is then sent to the Dealers who have to insert the end-customer names and add retail dates for the appropriate machines for that week. Hence, the Dealer provides information about orders in the pipeline, but also about the actual retail sales. The updated flash is then sent to market support, as well as carbon copy the flash to the forecasting responsible. During this time market support can retail the necessary machines in MOM and the forecasting desk can update the order backlog in MAIN as well as any MAS retails. When all retails for that week have been updated in MOM a new Flash Report can be created and the process can begin again (VCE Region International: Internal Flash Report Explanation, 2009). The orders remain in the Flash Report until the machine is retailed to the customer. Appendix 11.15 illustrates the whole process of the Flash Report creation.

This updating process between the market support and Dealers is recognized as a tool to improve the internal records. The idea is to make it easier for all sales people to monitor the activities in their territories.

As already explained in the forecasting process, ASMs communicate internally with their Dealers on a daily or weekly basis. Depending on the market, this is done via email, telephone or face-to-face meetings. This is followed by the already described two review-meetings, first on sub-regional level and followed by a review of Region International as a whole. The sub-regional level involves the responsible ASMs, VPs and (most of the time) BCs, whereas the review meeting on whole Region International involves the VP of Sales, the VP’s of the sub-regions and the VPT. After that, there is one more meeting between the sales-side and factory-side. This meeting involves the President of Region International, VP of Sales, the VPT, and the Commercial Management which consists of a representative of the Brussels’ HQ as well as the S&OP Leaders of each product group.

By looking at the identified practices and different steps involved in the current forecasting process, communication, collaboration, and cooperation can clearly be characterized as linear and straightforward procedures. The stream of the whole process, as well as the review meetings and validation checks, can be classified into three levels: Sub-regional level, Region International, and Global Production. The major links between these three levels are the BC
between sub-regional level and Region International, and the VPT between Region International and Global Production.

Regarding the market intelligence and data collection practices within the forecasting process, we partly recognize indicators of collaboration and cooperation within the whole process. Data collection is done independently by each contributor with no formal structure or system behind. This information is, to some degree, shared within the whole process examples are: the internal meetings between Dealers and ASMs, the review meeting between ASM and their sub-regional VPs, and the *EWI-Report* from VPT for ASMs and Dealers.

Figure 29 summarizes the internal communication flow within VCE Region International’s current forecasting process.

![Communication Flow within the total forecasting process](source: own)
4.5 Knowledge Use

In this section we put our focus on VCE Region International’s different time frames for forecasting and planning and describe the match these time frames and surfacing constraints. After that, we are exploring the issues of production lead-times, and the flexibility within the factory’s capacities.

Although we already related step 7 to the knowledge transformation stage, we recognize the outcome of this step, i.e. an aligned forecast between sales- and factory side, as the base for the knowledge use stage.

4.5.1 Forecasting versus Planning Time Frames

Apparently VCE Region International’s forecasting and planning time frames are based upon two different outlooks. This is mainly due to the information need, as well as access, and ability to use the information.

VCE Region International’s sales forecasts are based on a 12-month rolling forecast. This means that every month a forecast for the coming 12 months is generated. Most of our interviewees see this monthly creation as a clear advantage. One of the interviewees stated the following:

“the monthly updating or forecasting, allows changing the created forecast in the coming months” (BC, Interview).

According to our findings the sales forecasting process can be split into three time frames:

1. Short-term forecasting, i.e. 1 – 3 months
2. Mid-term forecasting, i.e. 4 – 6 months
3. Long-term forecasting, i.e. 7 – 12 months

At the current time, VCE Region International puts a lot of focus on short-term forecasting. The reason for that is the unstable and fast changing environment, enhanced by the effects from the financial crisis. Therefore the information and data available within the first three months is more reliable and less at the risk to change dramatically. Another important fact is that within that time frame Dealers and ASMs have higher knowledge about incoming orders.
and as a result a higher certainty about future sales. However, this implies that within the three months time frame forecasting is rather “order-casting” than actual demand projection. As a result, short-term forecasts reach a higher level of accuracy than long-term forecasts.

The mid- to long-term forecasts are mostly based on guesses. One of our interviewees explained that:

“foresights at total- and retail market development, is a Dealer’s best guess what he/she is able to sell, a projection of what can be sold, as well as observing if set market targets can be achieved” (ASM, Interview).

The forecasters’ difficulty to create a reliable forecast is also expressed by the following statement:

“the double impact of the financial crisis and the newly introduced forecasting system, makes it even harder to predict future sales. Right now looking one week ahead is almost as difficult as creating a reliable long-term forecast!” (ASM, Interview).

At the current time, there is no systematic way of separating the three forecasting time frames, meaning that same forecasting methods and information is used for creating short-, as well as mid- and long-term forecasts.

VCE Region International’s production planning applies somewhat different time frames:

1. Short-term, i.e. 1 – 3 months
2. Long-term, i.e. 4 – 18 months

Whereas the sales-side put their focus on the short-term, for the factory-side the short-term is not that “important”. This is mainly due to the fact that the production-side cannot change that much from the production point of view.

“The job in the industrial world happened already; people, material and machines are all-set to start production. There is not much to change within three months before production start.”

(Production Planner, Interview).

“If changes happen within this time frame, production-side either builds the machines to stock or cuts them out of production, both expensive procedures!” (Production Planner, Interview).

The longer perspective, i.e. 4 – 18 months, is the actual planning period for the factory-side. The MRP system, i.e. Material Requirements Planner, is a core program used at the
4. Empirical Evidence

production level. This system calculates the requirements for material for the coming 18 months, split up in monthly forecasts, and makes recommendations when to reorder materials.

Due to the fact that VCE Region International’s budgeting is based on a calendar year basis, whilst the production planning is based on an 18 month plan, the factory-side has to make guesses for the last six months. Usually, production planners extract the last built rates and extend it to their 18 months planning period. The same problem arises when doing the 12-months rolling forecast. The main issue is that the budget defines the Dealers and ASMs sales expenses, hence having a direct impact on the sales. So VCE Region International’s forecasters actually have to take a leap in the dark, forecasting blind into the future without knowing relevant figures from the budget.

Figure 31 shows the above discussed constraint of the sales-side forecast time frame, the production-sides planning time frame, and the budget planning time frame. The figure clearly illustrates the emerging time-gaps between those three functions, ultimately challenging VCE Region International’s personnel in fulfilling their monthly tasks.

![Figure 31: Different Functions - Different Foci, (Source: own)](image)

4.5.2 Production Lead Times & Flexibility

As already stated in the methodology, this thesis focuses on one specific business line, i.e. Articulated Haulers located in Braås, Sweden. Therefore, we had the chance to get a more detailed look into the production capacity flexibility for this particular product.

At the current time, the production line in Braås consists of two platforms:

1. Medium-size articulated haulers, i.e. A25 and A30
2. Large-size Articulated Haulers, i.e. A35 and A40

The two existing platforms are easy to adapt and interchange. Consequently, the production of these four models is quite flexible. One of the interviewees in Braås also mentioned VCE Region International’s strategic philosophy:

“the production of Articulated Haulers is composed of unique and main parts. In fact, 95% of the components within these four models are identical. The unique parts are typically the axles and related products”.

Under normal conditions, it takes about six weeks to change the production platforms in-between the four models (Capacity Planner, Interview). This flexibility is furthermore facilitated by the fact that Articulated Haulers are by nature products that are generally ordered in the spring- and summer season. If necessary, the production-site can build the machines until a certain level in advance. After receiving the final order the completion is finalized. Another factor that could influence a products lead time is country specific regulations, e.g. the Environmental Protection Agency emission rules (Volume Planner, Interview). There are different restrictions between countries and regions regarding the pollution of engines.

At the moment, the volume flexibility is around 50 units per week. In case incoming orders would extend this capacity, investments would be needed. This could include for example to hire new people and to enlarge production facilities. Such big investments implicate a change process over a longer period, approximately up to 12 months (Production Planner & Volume Planner, Interview). A result of such big changes would be longer lead times. However, the current market situation and demand do not require any investments. In fact, production-sites put their focus on balancing the current production capacities, as well as on downsizing the existing stocks at the factory.

In normal circumstances there is a six-week lead-time for the product group we have investigated. This means six weeks from the point the order is placed until the machine leaves the production-site. Due to the fact that there has been a sharp decline in the orders the lead-time might be less now, and closer to four weeks (Capacity Planner, Interview).
4.6 Feedback

This section deals with VCE Region International’s present approach of performance- and forecasting accuracy measurement. Therefore, we have a look at the current status of measurement, as well as the availability of forecasting guidelines and rules. Other aspects examined are the employment of training and feedback related to VCE Region International’s forecasting practices.

Figure 32 shows the relevant step, i.e. Feedback, for the feedback stage derived from the developed 8-step-forecasting process model.

![Step 8: Feedback](image)

Figure 32: Forecasting Step contained in Feedback, (Source: own)

4.6.1 Performance Measurement and Accuracy

At the current time there is no official performance measurement process or system integrated in VCE Region International’s forecasting process. However, VCE Region International’s recently hired a new manager for volume planning and order management. Although this person is not a forecasting champion per theoretical definition, one of the key responsibilities is to represent the group-manager of the current forecasting team. Hence this person shall take over the responsibility of the total forecasting process, e.g. develop and drive accuracy measurement, the generation of feedback reports and so on (VP Sales Region International, Interview).

So far it is up to the individual person, i.e. ASM or BC, to look at and measure the performance for their respective sub-region. According to our findings only a few BCs or ASMs accomplish this task. However, some of them are proactive and compare their forecasts with the actual sales. This information is then used and discussed during the next projection period. Hence, over- or under-forecasts are highlighted and they try to identify the reasons for that outcome (BC & ASM, Interview).

Another, partly utilized tool is the Qlikview system. The system allows generating figures and graphs about the accuracy of the forecast. This information is presented to some extend during the monthly update meetings, though VCE Region International does not seek for any follow-up discussion or an explanatory statement from the sales-side.
Many interviewees claimed that reports on performance that indicate errors and weaknesses would be helpful. Others mentioned a comparison on sub-regional performance could be motivating. However, opinions on the practicability differ. This is mainly due to the fact that VCE Region International’s sub-regions differ too much in various aspects, making it hard to draw reasonable comparisons.

The only measurement on a regular basis is done by the S&OP Leader. This measurement is fairly new and generated for the Demand Projection Review Meeting every month. Here, the S&OP Leaders of each product group use previous forecasts and match them to the actual sales. However, this measurement solely takes a short-term perspective. That means that they take the forecasts for e.g. April from the previous three months, i.e. January, February and March, and compare them to the actual sales of April. This information is then illustrated via graphs, aiming to visualize the development of the previous forecasts and to indicate to what degree the forecasts was accurate.

Besides of that, there is neither a systematic way of measuring the accuracy nor any special method that should be applied. A side effect of the many review meetings and revisions within the whole forecasting process is the difficulty to know who is responsible for the created forecast. Therefore it is also hard to relate the accuracy to a specific forecasting contributor.

4.6.2 Forecasting Guidelines & Rules

VCE Region International deploys no specific rules or guidelines for the creation of forecasts. However, two of our interviewees highlighted two general objectives of VCE Region International:

“the only guideline today is to decrease the inventory levels” (VPT, Interview),

“the general guideline is that the forecast should reflect reality” (ASM, Interview).

Another interviewee stated the following:

“If you want to do good business, you need to know everything about your business in different dimensions. This is rather logical, but solely relies on the person who creates the forecast.” (BC, Interview).

In the course of our research we could clearly see a welcoming attitude for some guidelines or directives. People would appreciate a certain set of rules, helping them to identify and collect
the right information. Conversely, most interviewees also recognized the difficulty in setting some standards.

“Right now, everybody works a bit different. This is mainly a result of the different degrees of information access at the different markets.” (VP, Interview).

“(…) it is hard to define a common working-method or to define a set of rules that can be applied for all of VCE Region International’s markets” (VPT, Interview).

Nonetheless, the creation of such guidelines would appeal to all of our interviewees. The following statement clearly shows the appreciation of guidelines:

“of course, a kind of checklist for the forecast generation would be great. Certainly people would try to exploit proposed sources and indicators that could support their decisions!” (ASM, Interview).

Figure 33 aims to illustrate how VCE Region International’s forecasts are created at the current time.

4.6.3 Training

The majority of our interviewees declared that the received training on forecasting was rather low. A common statement about the provided training was like the following:

“it was not really what we expected or wanted” (ASM, Interview).
The training that is conducted is evolving around the SAP 4C system: How to use it, and how to extract reports from the system. In fact the whole training was based on the new SAP 4C system, not looking into the total process of forecasting.

“For my opinion the training was at a too early stage. It was arranged in an artificial environment, hardly related to our actual markets” (ASM, Interview).

“We did not directly work with the system; it was more a presentation of the system than practical training on how to use it!” (BC, Interview).

“Apart from the small training sessions, it is a learning-by-doing process (…) often quite frustrating, as the system is still undergoing some changes!” (BC, Interview).

Also the production level lacked training on how to understand the forecasting process. So far it is their responsibility to understand how figures are created and use them accordingly.

Many ASMs and BCs said that they would appreciate more training on how to generate forecasts, including collection and the interpretation of data. One ASM mentioned:

“there is no specific training on what to look for or what is important” (ASM, Interview).

All in all, the interviewees agreed that there should be more training, helping to understand the system better. Furthermore many of them pointed out the need for some training regarding the understanding of the total process.

“An information meeting, explaining the whole picture, would be nice. This could definitely improve the total understanding of the process.” (BC, Interview).

4.6.4 Feedback

Today, there is no formalized way for feedback apart from informal discussion meetings and the diverse review meetings within the forecasting process.

Two of our interviewees mentioned some kind of feedback during their regular Business Meetings. During these meetings they receive an update on the market development, also indicating the sub-region’s sales development.

“This meeting also involves looking at the development of our sales compared to the forecasts. However, there is no discussion on how to improve or analysis on inaccuracy. It might be that they tell us where to pay attention, but that is all.” (BC, Interview).

However, some BCs noted that they look at the forecasting accuracy themselves.
4. Empirical Evidence

“I try to ascertain where and how my sub-region can improve, where we have to be careful.”

(BC, Interview).

All of our interviewees agree that there is a definite need for accuracy measurement and follow-up feedback.

“If you do not get feedback, you do not know if and how to improve!” (BC, Interview).
In this chapter we will analyze VCE Region International’s forecasting process. Therefore, the gathered empirical findings to answer the research questions are examined. Different and contradicting findings are discussed as well as patterns are identified based on the theoretical framework. To guarantee a consistent line within the thesis, we maintained a similar structure as in the empirical chapter.
5 Analysis

5.1 VCE Region International’s Overall Approach to Forecasting

Before analyzing the four steps generated in our analytical framework, we are providing an overview of VCE Region International’s general approach to forecasting.

The theoretical framework on forecasting approach proposes several aspects that need to be taken into consideration. One of these aspects is the definition of forecasting within a company. It is not rare for companies to mix their plans, targets and forecasts. All evidence in our empirical findings shows that VCE Region International has a relatively good separation between these three terms, however there is definitely some room for improvements. These areas are highlighted in the following pages. There is, however, one situation where we encountered a mixture is in the forecast creation. Here it seems to appear that the contributors tend to compare the 12-month rolling forecast with the 2-year budget.

This comparison may not harm the forecast as long as it only serves as a measure to evaluate if the forecast corresponds to the earlier planned budget. Conversely, if the forecasters utilize the budget-plan as a source of knowledge and base their projection on it, it might have a negative influence.

Another aspect that is discussed in the theoretical framework is how the forecast is created, e.g. with a bottom-up or top-down approach. When observing VCE Region International’s current forecasting practices the first notion is that VCE Region International deploys a very strict bottom-up approach. Yet, by analyzing VCE Region International’s forecasting process in more detail, we identified that the management has a central impact on the forecast generation. Hence, we categorize VCE Region International’s forecasting approach as a bottom-up, with some top-down influence. According to the theoretical framework, the perfect forecasting process is a combination of these two approaches. This is, of course, very dependent on the company’s environment, as well as products and so on. A turnaround situation, like the current financial crisis, makes it necessary for companies to have more control over their value chain. VCE Region International is aware of this necessity; hence they are trying to increase the control over several strategic and operational steps. This includes increasing their control over the forecasting process.

Various statements during our interviews highlight VCE Region International’s focus and move between a bottom-up and top-down forecast:
“It is not always that the guys who are in the middle of the mass know what is best” (VPT, Interview),

“Situations like today do require a different perspective (…)” (BC, Interview),

“(…) sometimes you have a better view if you are outside (…)” (VPT, Interview).

However, it seems that VCE Region International deploys this top-down approach solely when required.

Figure 34 summarizes the findings of our analysis, indicating VCE Region International’s current state of forecasting approach, as well as the prevailing weaknesses and potential areas of improvement to VCE Region International’s forecasting practices. At this point it is important to note that all of the aspects will be examined in detail in the course of this analysis chapter.

According to our analysis, VCE Region International is not a company in the world elite of forecasting, and there are many areas where they could improve. Figure 34 shows the major drawback of the current process is the lack of training in forecasting methods, both statistical and judgmental. The reasons for that are found in the analysis section of Knowledge Creation. Also important to note is that today VCE Region International treat all their products the same
way even though they have different forecasting needs. This will be explained further in the Knowledge Use section. All in all, VCE Region International is a company with some experience in forecasting but is lacking the more systematic approach. They lack a more general understanding of methods in forecasting and an evaluation of the process similar to other areas in the company. According to the theoretical framework, VCE Region International has a slight mixture of stage 1 and 2 company. Appendix 11.7 shows the four different stages that can be achieved in functional integration.
5.2 Knowledge Creation

The first stage in our analytical framework deals with the aspects of Knowledge Creation, i.e. when the forecast is generated. This involves an examination of VCE Region International’s current forecasting contributors, as well as their sources of knowledge. Furthermore, we analyze and evaluate the utilization of judgmental and statistical forecasting methods. This is then followed by analyzing VCE Region International’s forecasting practices with a focus on recent biases.

5.2.1 Contributors

Our empirical findings point out five main contributors at the knowledge creation stage in VCE Region International’s current forecasting process: Customers, Dealers, ASMs, the VPT, and VCE HQ. Each of these contributors makes use of human judgment, helping to incorporate inside information and expectations about future developments. This knowledge is by theory referred to as domain knowledge: Information dependent on contextual information that is not accessible through statistical data mining. The use of these contributors’ knowledge reveals VCE Region International’s understanding of the manifold information they need to incorporate in their forecasting process.

However, the degree of each contributor’s specific knowledge about the market differs to some extent. All empirical evidence reveals the fact that VCE Region International’s current sales forecasting process always starts with the Dealers’ and ASMs’ forecast about market development. Therefore, both Dealers and ASMs represent the sources with the highest domain knowledge, ultimately representing the two drivers of VCE Region International’s sales force composite. Our research definitely confirms that the sales staff has the closest connection to the end-customers, and that these contributors are the first who notice new trends in the market. This confirms with the discussed theory on domain knowledge, i.e. that typically the sales staff’s knowledge is one of the most typical used sources.

This is furthermore ratified by VCE Region International’s multidimensional approach toward the forecasting process. The theoretical framework proposes three main approaches: the grassroots approach, the sales management, and the distributor approach for the sales force composite.

VCE Region International’s focal approach is to accumulate sales forecasts for sub-regions, products and customers from VCE Region International sales people. This approach is by theory referred to as grassroots approach. However, VCE Region International also deploys a top-down approach, i.e. involving the sales management, which demonstrates VCE Region
International’s executive opinion. The third approach involves predictions from VCE Region International’s ASMs. Figure 35 subsequent illustrates the three different approaches.

![Diagram of VCE Region International’s Sales Force Composite Approaches](image)

This multidimensional approach fosters the accumulation of different sets of domain knowledge. Therefore, VCE Region International’s use of domain knowledge is rated as high. This level is verified by the incorporation of individual expertise that is closest to the end-customer, as well as the individuals’ solely focus on responsible markets and end-customers. Especially when changes in the environment happen so fast like in many of VCE Region International’s emerging markets, the use of sales force composite is superior. This is mainly due to the fact that statistical data cannot foresee such changes.

### 5.2.2 Sources of Knowledge

Creating valuable and correct forecasts requires the absorption of a lot of signals and information from markets. Our empirical findings regarding sources of knowledge validate that VCE Region International’s contributors have numerous sources of knowledge available. This knowledge ranges from business environment to industry environment, including country specific macroeconomic data, leading indicators, as well as sales statistics.

However, the current problem appears in the availability of information, but also the awareness of other existing sources of knowledge. These problems are leading to a lack of utilizing sources at full value.

The first problem might mainly be due to VCE Region International’s mixture of different degrees of levels of matured markets. Especially emerging country markets “suffer” from
high market instability, making it hard to obtain data that is consistent over a longer period of time. This setback is further enhanced by the fact that such markets often lack of hard data, i.e. country specific sales statistics, making it even harder to achieve a high level of hard information.

The second problem that is more changeable is the lack of awareness about existing sources of knowledge. Our empirical findings showed that VCE Region International’s Dealers and ASMs have their own set of information and data they use for their forecast creation.

By interviewing ASMs and BCs we discovered that the forecasters limit themselves to a certain - rather rigid - set of sources to create their forecasts. This is illustrated by:

“we have no time to look in myriad sources of data”, or
“(…) business intelligence sent by the HQ or VPT is interesting, but sometimes too extensive. We do not have the time to look at all this information”,

They point to some prejudiced opinions towards other information than the individuals’. Obviously, there is a lack of a common approach to forecasting among the different contributors. VCE Region International’s various markets have different characteristics and signals, making it necessary to have individual sources of information. The real issue is to have a common understanding of certain information and data that is valuable for the forecast creation. A common understanding of valuable sources could potentially help the creators to utilize existing data to its full potential, as well as discovering new sources that might be of interest.

5.2.3 VCE Region International’s Judgmental & Statistical Forecasting Practices

In the empirical part we described the overall forecasting process of VCE Region International and identified eight stages. By observing the process it is apparent that VCE Region International is a company mainly utilizing judgmental forecasting and judgmental adjustments. Therefore, there are only small contributions from statistical methods. Our theoretical framework reveals that companies that primarily use judgmental forecasting are companies that are operating in turbulent and global markets. When operating in such markets the feasibility of statistical methods might be lower. This is mainly due to the character of these markets, making it hard to forecast by looking at the past. The statistical methods are very dependent on a stable environment that follows some sort of trend, observable in historical data.
It is hard to say if this applies on a general level for VCE Region International because they operate in so many regions that are all very different in their characteristics. One example is a country like Australia that is probably the most developed market in the portfolio of VCE Region International. Australia has a very stable market, possessing plenty of statistical information, which is provided by several governmental or private institutions. This fact makes Australia more applicable for statistical methods. But other markets in Region International such as the Middle East, Africa and Central Asia are emerging markets or developing countries, which make them more turbulent and volatile. These countries also have less hard data available, because the governmental institutions are not as developed yet. This might be one of the reasons why VCE Region International puts heavy focus on judgmental forecasting methods.

The major strength of judgmental methods is the superior use of available and deployable domain knowledge. Earlier in our theoretical framework we defined domain knowledge as “information dependent on contextual information, i.e. market information that is not accessible through statistical data mining.” This definition implies that judgmental forecasting is not an alternative to statistical forecasting, but rather another option for areas where statistical information is not available.

Due to the complexity of all the sub-regions in Region International, we think that it would be impossible to make one generic definition on how to do forecasting. However, according to our theoretical framework, statistical forecasting has higher accuracy than judgmental forecasting and should therefore be used when possible. Today, VCE Region International does use some statistical information. However, this statistical information is still evaluated through a judgmental process. This means that the strength of the statistics is removed. Statistical information is superior because it has no biases and is objective. Nevertheless, VCE Region International forecasters solely utilize historical sales data to draw conclusions, but do not make any statistical analysis. Therefore, there is a gap between the use of available data and its full utilization.

An illustrative example for this gap is the forecasting generation process for the Australian market, where the forecasters use previous sales numbers. However, this data is solely evaluated on a judgmental level (BC, Interview). Therefore, VCE Region International’s current forecasting practices are open to the drawbacks of judgmental methods: the possibility of bias and the high expenses for qualitative forecasting.
As we found out, VCE Region International mainly makes use of the so-called sales force composite. Other forms of judgmental forecasting like intentions, and experts opinions are exploited to some extent.

Intentions are mainly utilized in regions where VCE Region International is very dependent on tenders, meaning that it is the forecaster’s job to scan the environment for potential projects. This could be classified as an intentions approach, but it is done in a non-systematic way, and we have not discovered any tools or guidelines for this. It is clear that for some regions it is a crucial method for forecasting, especially because products in these regions tends to be sold in bulks making them hard to predict with alternative methods.

Expert opinions refer to experts outside the company that try to tell how they think the demand will change. VCE Region International utilizes experts in the way of consultants that provide data to support the forecasting process. However, we cannot guarantee if VCE Region International’s ‘use’ of experts confirms with the theoretical definition of expert opinion. This is due to the fact that VCE Region International’s experts mainly provide macroeconomic data, leaving other valuable sources behind. Therefore, it is hard to define it as a judgmental method. Moreover, we do not see any specific need for VCE Region International to utilize experts, as their current level of information and data can be ranked as high and sufficient.

One forecasting method we could not identify at VCE Region International is judgmental bootstrapping. As explained in the theoretical framework on page 53, judgmental bootstrapping aims to create a model/procedure of the forecasters’ judgmental forecasting, hence, a company can define and create some sort of best practice of the prevailing methods from its forecasters. As we see it, this method has high potential as a supportive tool in forecasting. Today, VCE Region International has no systematic way to apply best practices of forecasting in-between their contributors. In fact there is no “method or practice – sharing” at all. This is a major gap also shown by our empirical findings. VCE Region International’s contributors have different backgrounds and experience with forecasting, some more some less. Therefore, benchmarking of different forecasting methods could potentially help to share specific knowledge and learn from each other. However, such benchmarking would require more measurement of accuracy and performance than currently in place at VCE Region International.
Use Tools Wisely

Our theoretical framework on sales forecasting suggests deploying a balance of both statistical and judgmental forecasting methods. As seen in the previous section, VCE Region International’s current sales forecasting practices are clearly dominated by judgmental methods. Our empirical findings show a clear gap to integrate statistical forecasts into current practices.

Many of VCE Region International’s markets are characterized as volatile and turbulent, and therefore it might be hard to look at previous data to predict the future. Nevertheless, statistical forecasting has a big potential to improve the overall forecasting process that it should be considered as a forecasting tool.

The theoretical framework verifies that even when historical data has high instability or uncertainty, the integration of both methods is still recommendable. Our empirical findings indicate the existence of a high degree of domain knowledge and experience. When comparing these facts to the theoretical framework, we can identify five statistical methods that have the potential to support a judgmental forecast:

1. Revising Judgment
2. Revising Extrapolations
3. Combining
4. Rule-Based Forecasting
5. Econometric Methods

Revising judgment, or extrapolations as well as a combination are recommended for volatile markets, whereas RBF and econometric forecasting are best fit for less volatile environments, but markets with high domain knowledge.

We have no evidence on the feasibility of integrating these methods. However, our theoretical framework validates that a combination of forecasts makes it possible to compensate the diverse drawbacks of applied methods. Therefore, VCE Region International may be able to reduce the likelihood of evolving biases from their judgmental methods.

5.2.4 Judgmental Bias in Forecasting

As mentioned earlier in our theoretical framework, judgmental forecasting can be just as accurate as statistical forecasting. There are, however, some weak points in both types of forecasting that could harm the accuracy of a forecast. Because VCE Region International
primarily uses judgmental forecasting methods, this section focuses on the drawbacks for judgmental forecasting.

All evidence in the empirical findings points at major biases that influence VCE Region International’s forecasts in a negative way:

- Bias of History
- Optimism and Wishful Thinking
- Availability
- Game-Playing

One of the weaknesses mentioned in the theoretical framework is the situation where the forecaster has an overly positive or negative expectation about the market. Our empirical findings indicate that VCE Region International’s ASMs and Dealers have a clear tendency to have too positive expectations about their markets’ development and related sales. As mentioned by several interviewees the forecasts coming from the ASMs are typically adjusted downwards by management because they were perceived as too high. The question is if this is good or bad?

As long as the management is aware of the ASMs and Dealers tendency to over-forecast, they can adjust the forecasts and the damage to the forecasting accuracy can be controlled. However, we believe it is contradictory to have adjustments made by contributors who have less domain knowledge than the ASM or Dealer. Fact is that the sales force has superior knowledge about the markets they are working in. Therefore, they should be the ones who are best qualified to create a forecast. As long as VCE Region International utilizes only judgmental forecasting they are dependent on that domain knowledge.

It also seems that some forecasters rely on specific/recent events and information. This leads to an exclusion of other pertinent information that might be of value for the forecasters. Even though VCE Region International puts a lot of effort in making helpful information available, ASMs and Dealers do not use this information to its full potential. Some ASMs explained that the information is too extensive; accumulating to an unmanageable amount of data and that there is too little time to consider all of it.

Two more drawbacks that could potentially hurt the accuracy is the bias of history and game-playing. In the course of our interviews, many interviewees mentioned prior problems with product allocation. Due to capacity restraints, ASMs and Dealers did not receive enough machines. Therefore, Dealers and ASMs started to over-forecast to enhance the chance to receive the requested units. Although VCE Region International is experiencing rather the
opposite of this situation at the moment, the experience of that time is still evident in Dealers and ASMs minds. Sooner or later, when VCE Region International’s markets start to prosper this shortcoming might trigger previous forecasting practices.

Another potential bias is game-playing. Although our empirical findings do not prove the existence of game-playing, there are some indicators that allow this bias in the forecasting process. As our empirical findings show, the ASMs are paid on a fixed salary. However, the Dealers in some countries do utilize performance based salary systems. This means that as long as the sales persons at the Dealers are involved in the forecasting practices, there is a climate that would allow for game-playing. As already stated, at the current time there is no evidence for game-playing. However, the described symptoms stated in our theoretical framework are present. Therefore, we believe that there is a risk for game-playing to emerge.

Today, the contributors look at historical sales data as a support to the forecast. However, they are not confronted and asked to justify if there is a big difference with what the statistical forecasting suggest and their own judgmental forecast. This is of course because VCE Region International does not currently use statistics to create a forecast. By this we mean that they do not utilize methods such as: extrapolation, rule-based forecasting, expert systems and econometric methods. For the extrapolation all the data is available and it seems strange not to use it in a statistical method in order to support, and maybe even question the judgmental forecasting. This would maybe also force the current forecasting contributors to rethink their forecasts and reconsider the reasoning behind it.
5. Analysis

5.3 Knowledge Transformation

The second stage in our analytical framework deals with the aspects of knowledge transformation, i.e. when the forecast gets altered into production plans. The illustrated forecasting process, see Figure 22 in the empirical chapter, displays the different steps that are involved. Starting with the so-called Knowledge Creation at the ASMs, we analyzed in the prior section. The Knowledge Creation, is then followed by the Knowledge Transformation containing several steps before turning the forecast into a plan.

In this section we will analyze the integration process of the forecasts and compare our empirical findings to recommendations from our theoretical framework. By benchmarking VCE Region International on the dimensions of functional integration we aim to evaluate the status-quo of transforming forecasts to production plans. Furthermore we will investigate the degree of Communication, Cooperation and Collaboration (CCC) between the involved contributors and departments. The analysis of functional integration and CCC is closely related. However, functional integration puts more attention towards the transformation from an un-constrained market demand forecast, made by the ASM, to a constrained plan implemented at the production facility. CCC evaluates the links between the different contributors and departments, aiming to examine VCE Region International’s internal environment to stimulate CCC. Thereby we also examine the potential for Islands of Analysis, as well as the efficiency of the different systems and tools utilized for current forecasting procedures.

5.3.1 Functional Integration

According to our theoretical framework, companies have to possess a functional integration within their forecasting interrelated functions, i.e. marketing, sales, production, finance, and logistics. In order to reach stage four of functional integration, a high level of Communication, Coordination, and Collaboration within the company is required. The better the CCC, the more efficient and accurate forecasting becomes.

When comparing our empirical findings to the characteristics of the four stages of functional integration, we clearly see that VCE Region International is no novice when it comes to functional integration. Appendix 11.6 shows the four different stages that can be achieved in function integration.

All in all, we come to the conclusion that VCE Region International achieved two major aspects from stage two proposed from the theoretical framework.
These two aspects are:

1. Forecasting is located in a certain area that drives the forecast
2. Planned consensus meetings, but dominated by operations, finance, or marketing – no real consensus reached

All evidence illustrates that the VPT, together with the VP of Sales are the main drivers behind the forecasting process. When we asked our interviewees about the key-responsible person/function for the forecasting process, the VPT or the VP of Sales was stated.

However, our findings also indicate that forecasting is a multifunctional activity in VCE Region International, i.e. that several departments contribute to the outcome of the forecast. The three main functions involved are: Sales, Marketing, and Production. Due to the fact that production and logistics are quite integrated in VCE Region International, logistics is also involved in the forecasting process. This means that there is one combined effort to create the forecast, facilitating a common approach to the process.

The second aspect of stage two is the planned consensus meeting. As described in our empirical findings, VCE Region International deploys the so-called Demand Review Meeting, to discuss and agree on the final numbers on forecasted units. However, according to our findings and observations the production-side directs this meeting. Our observations confirm that there is no real consensus during this meeting, rather a conjoint conclusion between the respective functions.

The two other aspects from stage two, dealing with coordination of functions and performance rewards are not reached. Although our empirical findings state that VCE Region International forecasting process is a multifunctional activity, there is still a big gap in coordinating the involved functions.

One of the indicators for a “stage one company” in functional integration is the lack of accountability for the forecast. The existence of this dilemma was evident in several interviews.

“There are so many changes to the forecasts, that it is hard to see who is responsible for the forecast in the very end!” (ASM, Interview).

According to our theoretical framework, a company that does not measure an activity is hardly able to hold people accountable and improve their activity. Actually VCE Region International does try to follow up on forecasting performance, but so far have not found a
proper way of doing this. This gap will be discussed in more detail in the analysis of the performance measurement. Fact is that a lack of performance measurements makes it rather impossible to determine responsible persons, and evaluate them.

Overall, our analysis shows that VCE Region International’s level of functional integration is a slight mixture of stage one and two. Figure 36 summarizes the findings of our analysis, indicating VCE Region International’s current stage of functional integration, as well as the existing drawbacks from stage one and potential areas that could be improved in order to achieve the next stage.

![VCE Region International's Functional Integration](image)

**Figure 36: Overview Functional Integration in VCE Region International, (Source: own)**

### 5.3.2 Communicate, Cooperate, and Collaborate

As described in our theoretical framework, CCC aims to identify weaknesses or lacks in a company’s forecasting process regarding communication, cooperation and collaboration. There are three major stages a company can reach: one-way communication, cooperation and two-way communication and true collaboration. The better the CCC, the more efficient and accurate forecasting becomes.
All empirical findings point to a slight mixture of stages one and two, as well as a move in the direction of stage three, i.e. true collaboration. In the empirical findings we see that VCE Region International’s forecasting process consists mainly of linear communication, a step-by-step communication, between the contributors evolving in the forecasting process. Therefore, the forecast moves step-by-step forward until it reaches the S&OP. None of the interviewees clearly stated an existence of mistrust. However, the fact that VCE Region International includes several review- and adjustment meetings in their forecasting process, as well as a general decrease of the forecasts from ASMs and Dealers, makes some distrust evident. It also seems that there is a lack of a common approach to forecasting among the contributors, especially when we look at the different organizational levels involved: sub-regional, region international and global production. Some of our interviewees made statements like:

“dealers and ASMs do not look at the total picture; they do not care about the long-term perspective” (VPT, Interview) or

“we do not know how they come up with their numbers” (S&OP Leader, Interview).

These findings, among other empirical evidence, hint of an arising mistrust, lack of common understanding and reasoning behind the forecasts. Moreover, the feeling of missing involvement and apprehension of the total forecasting process develop mistrust and tension between the different functions.

However, VCE Region International also accomplished some kind of cooperation in their forecasting process as they have one official forecasting procedure that comprises the individual forecasts. As stated above, VCE Region International’s overall forecasting process is characterized by linear and one-way communication. Conversely, when we analyze the communication between e.g. ASM and BC we can identify some sort of two-way communication, as those two contributors discuss and adjust the ASMs forecast. However, this two-way communication solely evolves between each step of the forecasting process, which in turn disallows the later contributors to be aware of the original forecast prior the adjustments. This generates a deficient understanding of the forecasts ownership. Figure 37 aims to illustrate VCE Region International’s gap between one-way and real two-way communication, ultimately failing to achieve true collaboration in their current forecasting process.
Figure 37: Communication versus Collaboration, (Source: own)

The grey circles illustrate the contributors in a forecasting process, contributor A and B have a two-way communication, where the original forecast X get transformed into forecast Y. This transformation is then done throughout each step of the process. Hence, two-way communication solely exists between the contributors of each step and the total forecast process is driven by a linear one-way communication. The lower model in the figure 37 illustrates how the process of full collaboration would look like. It clearly indicates that all contributors come together and develop one consensus forecast. According to our theoretical framework, this ultimately leads to a better overall understanding of the forecasts, but also to improved forecasting accuracy and efficiency within the functions.

True collaboration is also characterized by the existence of a forecasting champion, a person who oversees the whole forecasting process. At the time we conducted our research, VCE Region International did not possess any kind of forecasting champion. As stated earlier in this section, our interviewees entitled the VP of Sales as the responsible person for the current forecasting process. However, the VP of Sales made clear that his tasks could not be equalized with a forecasting champion. VCE Region International is aware of the need of such a person; hence has currently appointed a suitable person to take over these concerns (VP of Sales, Interview).

5.3.3 Islands of Analysis

By analyzing our empirical findings, there is evidence that points to certain indicators of so-called islands of analysis. These islands are a side effect of VCE Region International’s insufficient Communication, Cooperation and Collaboration throughout the whole forecasting
process. Evidence shows that VCE Region International’s market intelligence and data collection practices are moderately shared. However, in the majority of cases each contributor basically creates an own base of data to generate a forecast, without any formal structure or system behind. Moreover, some interviewees stated that even though there is a discussion of the data utilized for the forecast, they do not always exchange the sources of the base for their forecast. Therefore, it could be that potential information of interest and value, as well as the understanding are not shared. This could lead on the one hand to a potential source of mistrust and tensions between the different contributors. On the other hand, this may also indicate the existence of redundant information collection, leading to extra costs of company resources and extra man-hours that could be avoided.

Albeit SAP 4C is the actual forecasting system, there are still various systems and programs containing information for the forecasting process. However, VCE Region International puts a lot of effort in generating a unified system, aiming to share all necessary information and afford the forecasters’ access to a joint database. A unified system across all functions could potentially help to remove the causes of islands of analysis.

5.3.4 Supportive Tools & Systems

In the empirical findings, the array of supporting systems and programs has not only proved the complexity of VCE Region International’s systems and tools, but also its facilitation for the current forecasting practices. Complexity refers to the numerous systems and programs that are available to support VCE Region International’s forecasters. This could be either considered as an advantage or disadvantage.

Most of our interviewees from the sub-regional level regard this complexity as unhelpful. First of all it would be too time-consuming to utilize all tools, as well as there is a common lack of knowledge on how to use some systems. VCE Region International recognizes this problem, and therefore started to integrate systems to have one shared database.

By analyzing the empirical findings we come to the conclusion that VCE Region International reached stage two of four, proposed by the theory. Appendix 11.8 shows the four different stages that can be achieved in Systems. All aspects, i.e. electronic links between the different departments, on-screen reports and measurements exist in the current forecasting process. A common ownership of databases and information system is not wholly achieved. Systems like EcoWin are constrained to certain users, because of the high costs for licenses and its
complex handling. The only criterion of step two that is not reached is the periodical generation of reports, being a prospect improvement for VCE Region International.

Figure 38 summarizes the findings of our analysis, indicating the current stage VCE Region International is positioned, as well as the existing drawbacks from stage one and potential areas that could be improved in order to reach the next stage.

### VCE Region International’s Systems

<table>
<thead>
<tr>
<th>Drawbacks</th>
<th>Status Quo</th>
<th>Potential Areas of Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual transfer of data from one system to another</td>
<td>Electronic links between marketing, finance, forecasting, manufacturing, logistics, and sales systems</td>
<td>Reports periodically generated</td>
</tr>
<tr>
<td>Lack of cooperation between information in different systems</td>
<td>On-screen reports available</td>
<td>Improved system user interfaces to allow subjective input</td>
</tr>
<tr>
<td>Few people understand systems and their interaction</td>
<td>Measures of performance available in reports and in the system</td>
<td>Reports generated on demand/performance measures available online</td>
</tr>
<tr>
<td>Lack of performance metrics in any of the systems or reports</td>
<td>Common ownership of databases and information systems*</td>
<td>Open-system architecture means all affected areas can provide electronic input to the forecasting process</td>
</tr>
</tbody>
</table>

* Depending on the system/program

Figure 38: Overview Systems Stage of VCE Region International, (Source: own)
5.4  Knowledge Use

The third stage in our analytical framework deals with the aspects of knowledge use, i.e. how the created forecast is used at the production level. Therefore, we are analyzing the compliance of forecasting and planning time frames, as well as identify issues related to lead times, and the flexibility within the factory’s capacities.

5.4.1  Forecasting versus Planning

As described in our empirical findings, VCE Region International’s product range varies from big machines like the Articulated Haulers and Front Wheel Loaders, to smaller machines like the Backhoe Loaders and Skid Steers. Due to our focus on one single product, i.e. Articulated Haulers, we center our analysis on findings and information for this specific product. However, we believe that our results are also applicable for other products.

Our theoretical framework highlights an important aspect in forecasting: Different product segments have different forecasting needs and foci. Nonetheless, as long as a company has one approach for forecasting, every product is treated the same way. This corresponds with an old saying “if your only tool is a hammer, you treat everything like a nail”.

This is in compliance with VCE Region International’s current approach to forecasting, i.e. they do not differentiate between special forecasting needs relating to a specific product group. Even though on an organizational level this common approach is fitting, the production level seems to require a more detailed approach, especially related to time frames.

Currently, there is a lack of responsiveness for the different “needs” among the production-side and sales-side. This issue is about understanding the needs of both sides and to provide what each really needs. Right now VCE Region International has a 12-month rolling forecast, where every month has equal importance and is forecasted more or less in the same way. However, through our research we found that the sales force tended to focus more on the short-term. This is mainly due to the fact that the information used for creating the forecast has a higher certainty, plus the sales force knows about sales on hand. The production-side, on the other hand, perceives these short-term forecasts as rather unimportant as this time frame cannot influence their production plans. Hence, the production-side is more interested in mid- to long-term forecasting. The information from the mid- to long-term forecast is integrated in the production plans, helping the production-side to schedule the purchase of material, as well as to add in changes of orders. Such changes can include orders for smaller or higher quantities of products from suppliers or adjusting manpower.
These different foci in the time frames cause a gap as there is a lack of understanding the actual needs between the contributors that create and use the forecast.

As mentioned earlier it is crucial that all contributors in the forecasting process understand their role within the total process. However, maybe more important is the understanding of each contributor’s needs, especially those of the production-side as they are the ones who utilize the forecast. In the course of our interviews, we got the impression that the sales-side definitely lacks in the awareness of this need. As it is today, the production-side lacks in accurate forecasts, enabling them to arrange a stable production.

Throughout our interviews we came around statements like the following:

“As the forecasting process is now 12-month rolling, we do not need to worry so much about the long-term. Now we have the possibility to change our forecast several times.”

If this is the widespread attitude this could create serious problems for the production-side. Fact is that production is very dependent on solid and stable mid- to long-term forecasts; this should be acknowledged and accomplished by the sales-side.
5.5 Feedback

The fourth stage in our analytical framework deals with the aspects of feedback. Therefore, we are analyzing the current performance measurement practices employed at VCE Region International. Furthermore, we examine the availability of forecasting guidelines and rules, as well as identify issues related to forecasting training and feedback.

5.5.1 Performance Measurement

Companies that measure accuracy and efficiency of their forecasting procedures are able to identify their weaknesses and sources of errors. Consequently, the forecasting contributors in such a company can learn from what was effective and correct, and what was not.

All our empirical findings show that performance measurement on forecasting accuracy is an almost non-existing term in VCE Region International. There is no systematic way of measuring the accuracy of the forecasts. However, there are some exceptions, such as some ASMs or BCs that do compare and evaluate previous forecasts with the actual sales for their regions. Currently the S&OP Leaders also look at the accuracy of the received forecasts compared to the actual sales, but this information is rather used more as an update than anything else. Apart from these minor casual measurements, we found very little evidence of any performance measurement, or written statements on individual performance.

As explained in our theoretical framework, there are three major issues and symptoms that occur through a lack of measurement practices:

1. Not knowing the firm is getting better
2. Accuracy not measured at relevant levels of aggregation
3. Inability to isolate sources of forecast errors

When comparing this with our empirical findings, it is evident that VCE Region International lacks in its performance measurement practices.

First of all, currently VCE Region International does not have a systematic measurement of the forecasting performance. Hence, there is no awareness about improvement or deterioration in their performance. Considering that VCE Regional International has recently implemented a new forecasting system to improve their forecasting practices, it should be in their interest to identify such changes in performance.

As we described in the empirical chapter, VCE Regional International’s forecasting process contains several review meetings where the forecast might be subject to change. Due to the
fact that the current forecasting process involves forecasts from six sub-regions, which are furthermore broken down in their markets, it seems natural to review and aggregate these forecasts in order to come to a total forecast. However, every time a forecast is reviewed there are some adjustments and changes. As we found out, these adjustments and changes are not documented in a formal way, e.g. a description of the reasoning behind the changes or stating the person who was decisive for the change. This entails that the accountability for the forecast gets blurred, making it hard to isolate sources of forecast errors in retrospect. When considering all aspects, today VCE Region International is not able to isolate where the “bad seeds” are in the forecasting process, thereby making it hard to improve in these places.

By comparing our empirical findings to the characteristics of the four stages of performance measurement, we clearly see that VCE Region International has several potential areas to improve. Today they are characterized as a stage one company, i.e. the lowest stage. Appendix 11.9 shows the four different stages that can be achieved in performance measurement. Figure 39 summarizes the findings of our analysis, indicating VCE Region International’s current stage of performance measurement, as well as the potential areas that could to be improved in order to achieve a higher stage. Due to the fact that VCE Region International is a stage one company, there are no drawbacks from a prior stage.

### VCE Region International’s Performance Measurement

<table>
<thead>
<tr>
<th>Drawbacks</th>
<th>Status Quo</th>
<th>Potential Areas of Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Due to the fact that VCE is a stage one company, there are no drawbacks from a prior stage</td>
<td>Accuracy not measured</td>
<td>Multidimensional metrics of forecasting performance</td>
</tr>
<tr>
<td></td>
<td>Forecasting performance evaluation not tied to any measure of accuracy</td>
<td>Both graphical and numerical illustrations of forecasting accuracy</td>
</tr>
<tr>
<td></td>
<td>Evaluation often tied to meeting plan, or reconciliation with plan</td>
<td>Forecasting error treated as indication of the need for a problem search</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not only looking at accuracy, but also taking into consideration its effect on all operations</td>
</tr>
</tbody>
</table>

Figure 39: Overview Performance Measurement of VCE Region International, (Source: own)
5.5.2 Forecasting Training & Guidelines

Training is a crucial aspect for the whole forecasting process, and directly intermingled with a company’s forecasting performance. Our theoretical framework reveals that well-educated and trained forecasting personnel is superior regarding forecasting practices as well as forecasting accuracy, and they are also better motivated!

All empirical evidence clearly points to insufficient training-practices at VCE Region International. As we found out, training is solely based on the implementation of the new forecasting system SAP 4C. However, most of our interviewees stated that this training was not really what they expected, i.e. too little and not based on real-life situations.

Apart from this system training, we have no evidence that VCE Region International deploys any training relevant to its forecasting practices.

Theory proposes three aspects to evaluate the need for more training:

1. Personnel sophistication involved in the forecasting function
2. The personnel’s educational background on statistic or econometrics
3. Level of experience and knowledge of their industry

Our research revealed that VCE Region International’s forecasting contributors have different levels of experience and knowledge of the construction equipment industry. However, all our interviewees seemed to have an overall high level of industry-relevant information. As it seems today, Dealers and ASMs are the most sophisticated contributors when it comes to domain knowledge. Unfortunately, we do not have any evidence about the contributors’ educational background on statistics or econometrics.

As already stated, the forecasters solely received training in connection with the new forecasting system. The major gap we could identify is awareness and knowledge of different forecasting tools and methods. This clearly points to a need for more training, though training-needs vary from the forecasters’ tasks and duties. Hence, it is important to distinguish between the training needs of the personnel, e.g. personnel that creates, adjusts and / or utilizes the forecast.

VCE Region International’s ASMs are the key personnel regarding the forecast creation, mainly characterized by their high level of domain knowledge about their markets. In order to be superior in their forecasting practices, the ASMs need more than their domain knowledge. To facilitate the use of this knowledge to its full potential, training for both judgmental and
5. Analysis

statistical forecasting methods is required. This training should not solely focus on understanding the different methods that are available, but also indicate how to utilize and in which situations they are most suitable. Such training-needs are not fulfilled at the current time.

The ASMs are not the only ones who lack training. The BCs and the VPs are the key responsible persons for adjusting the forecasts, and so far there is no training on how to do this in an appropriate way. According to theory a personnel that is involved in judgmental adjustments should be trained in how to utilize experience and outside inputs to systematically make judgmental forecasts. As well as to document and report this process, ultimately developing a logical process understandable and useable for others involved in the forecasting process.

S&OP Leaders are the contributors that use and transform the forecast into plans. Again, they did not receive any specific training on forecasting. In line with theory, these persons should receive training to understand the total process behind the creation of a forecast. Our findings cannot reveal how much educational background each contributor has. In the course of our interviews we could solely observe that all interviewees had a basic knowledge and knew about forecasting methods. However, none of our interviewees could state that they received specific training on methods.

All in all, most of our interviewees asked for some information and training to understand the total forecasting process. Mostly ASMs and BCs stated that some kind of rules or guidelines on how to do their forecasting could be helpful. Although a standardized way of creating their forecasts is rather impossible due to the dissimilar characteristics in diverse markets, a set of general guidelines may be beneficial. Such guidelines could identify prospective sources of information and indicators, as well as where and when to use statistical or judgmental methods.
In this chapter all the findings and results from the analysis are summarized and viewed against the research questions. To solve the main strategic problem, conclusions are based on the four research problems. Therefore, this chapter is structured according to the outline of the research process. To visualize how the forecasting management process within an MNC can be organized in a systematic way, as well as to improve its efficiency and accuracy, a model is created. This model is presented at the end of this chapter, explaining the identified aspects of the forecasting management process that need to be taken into consideration.
6 Conclusion on Forecasting Management

In the next four subchapters the research questions are answered in the order the research has revealed the findings for each question. This means that the main strategic question is answered in the fifth subchapter.

All conclusions are drawn on the findings from this case study research. The case company, i.e. Volvo Construction Equipment Region International, is part of the Swedish base Volvo Group. VCE Region International sells and distributes construction equipment to a large part of the world, i.e. mainly emerging and developing countries. The company’s distribution network relies on independent and Volvo-owned Dealers, supported by responsible ASMs managers that are spread out across countries.

The reasons we are mentioning this, is that VCE Region International’s business model has great impact on the existing forecasting practices and how they are managed. Therefore, these conclusions are based on this specific business set-up. Consequently, for MNCs comprising a similar distribution network as well as operating in emerging country markets, the conclusions derived from this research should be especially relevant for these companies.

Hence, these conclusions are made on a general perspective, meaning that we extrapolated the results from our case study research to a wider body of MNCs.
6. Conclusions on Forecasting Management

6.1 Research Question 1

**Research Question 1**

How does the forecasting process look like, i.e. how the forecasted data flows from markets to production?

The answer to research question 1 is based on our findings from the case study of VCE Region International’s current forecasting practices. In fact, the answer is mostly related to step one in our analytical framework: Knowledge Creation and Forecasting Approach, where we investigated the current forecasting process at VCE Region International.

Forecasting processes can differ from company to company. There are various parameters that influence how a company’s forecasting process looks like, such as the product portfolio, the company’s markets, resource planning, as well as the different functions involved in the forecasting process. The forecasting process examined is no generic process but customized to the kind of MNC our case study company represents. Hence, it seems logical to highlight important characteristics of the forecasting process, rather than explaining each step from the forecast generation to the utilization.

These characteristics can be arranged in four groups:

1. Market Characteristics and Sources of Knowledge
2. Bottom-up versus Top-Down Forecasting
3. Organizational Targets and Plans versus Forecasting
4. Communication, Cooperation, and Collaboration

The first important aspect is the market environment a company operates in. The case company of this thesis operates worldwide on global markets with a focus on emerging and developing country markets like Africa, Middle East, Russia and South America. The only market that may be distinguished is Australia - classified as a developed market, similar to the Western world. Companies that operate in markets like the above mentioned, undergo rapid changes and unpredictable market developments. Such a dynamic and unstable market environment challenges a company’s ability to create reliable forecasts. An ideal forecasting environment provides access to all data and information of interest. However, emerging or developing country markets do not always possess a great selection of reliable sources of knowledge that facilitate forecast creation. Hence the forecasting process relies heavily on the domain knowledge from the company’s local sales force. As mentioned in the introduction,
the case company’s distribution network utilizes dependent or independent Dealers situated in the operating markets. Hence the Dealers are the ones who are in direct contact with the end-customers and other networks within the respective market. This domain knowledge contains for example information about government legislation, incoming orders, end-customers intentions, political changes and the country-specific market development. As a result the local Dealers acquire essential information that serves as a foundation for their forecasts.

For an MNC that exploits a different distribution network-strategy, this might be a challenging task. Hence, we see it as important for MNCs that operate in markets experiencing shifting trends and market turnarounds to create a distribution network with close ties to the country environment.

The next aspect that has great importance in respect of the forecasting process is the forecast approach. Whereas the bottom-up approach focuses on the input from the market-side, the top-down approach concentrates on management delegation. MNCs may also integrate both approaches. As described in the last paragraph, markets strongly differ in their prevailing characteristics, as well as they change over time. For periods of relative stable growth and economic prosperity companies may rely on a bottom-up approach. The reason for that is the already mentioned domain knowledge of the company’s sales force. Sales people are the closest link to the market, having the best knowledge on projects in the pipeline as well as upcoming governmental decisions that could potentially affect the company’s sales. However, a global turnaround situation as companies experience right now, requires a more top-down approach. This enables the company to have more control on their operations. As we found out, people at the management level are usually more inclined to have a broader knowledge about macroeconomic factors, as well as knowledge on business functions and operations. This enables them to see the total picture of their business situation opposed to the sales force that is “in the midst of the battle” as one might say.

The third aspect we identified is the importance of understanding the similarities and differences between organizational plans, targets and forecasting. Many MNCs set up operational targets and budgets for the coming one or two years, these plans work as guidelines and strategic goals the organization aims to pursue. Although forecasting is closely related to these operational plans, companies tend to make the mistake to derive their forecasts from these plans instead of doing it the other way around. It is more effective to start planning with a projection of the future estimated demand, based on expected economic and
6. Conclusions on Forecasting Management

competitive conditions and marketing-, sales-, production-, and logistic plans. This projection is the foundation for developing a business plan.

A common mistake is that forecasts are influenced by budget or target plans; this could severely hurt the accuracy as well as credibility of a forecast. Hence it is crucial that MNCs understand that business plans should be flexible to the forecast, and not the other way around.

The last aspect we discovered is the communication, cooperation and collaboration of all functions involved in the forecasting process. This aspect is termed as functional integration. Evidence shows that every function involved in forecasting has a different angle and supportive information to the forecast process. Consequently it is important that all relevant functions are integrated into the forecasting process. Functions typically involved in the forecasting process are sales, marketing, production, logistics and purchase. Such integration allows a common ownership of the forecast, facilitating a high level of trust in and understanding of the forecast throughout the whole organization.

The drawback of controlling the forecasting process by only one function is that it can lead to mistrust between the functions, as well as to the possibility of emergence of “islands of analysis”. To ensure an integration of all functions, a company may appoint a forecasting champion, who is foremost responsible for the forecasting process and practices in a company. This involves supervising that collaboration between different functions exists, that people have trust and understand the forecasting system and process. This ensures accountability of forecasting errors, as well as to monitor continuous improvements and training needs.

Today, many forecasting systems are available that can be used for these purposes, and every MNC can find the software system that fits its specific needs. One major fact to consider when choosing a software system is that is should support the forecasting process, not define it! Forecasting is not a software system, but a process of collaboration throughout the relevant functions of the company.
6.2 Research Question 2

MNCs like VCE Region International have many product groups of construction equipment, varying from small to big machines. Hence there is a difference in production needs for these two product groups. Smaller machines, i.e. often “shelf-products”, have a reduced amount of planning requirements. The reason for that is that the product allocation, such as material and spare parts, is usually faster to attain. Bigger machines usually contain a more complex product allocation process involving distributors, and manpower as well as material acquisition. This allocation process ultimately requires more time to complete. Due to this divergence, lead-times for smaller machines are often shorter than lead-times for bigger ones.

Therefore, the production of smaller products is faster, as well as more flexible to changes from the market-side. However, products with longer lead-times necessitate reliable long-term forecasts. By providing long-term forecasts at a reasonable time, the production-side is able to comprehend an optimal resource planning and production process.

Evidence from our study shows that today’s market, especially the emerging country markets’ fast dynamic and unstable environments, makes it hard to create long-term predictions. It is the sales force’s nature to concentrate on the short-term, utilizing their domain knowledge about the market as well as business experience. Therefore, short-term forecasts are more likely to be correct and the long-term forecasts have the tendency to become wide guesses. This creates a gap between different foci at the sales-side and factory-side, i.e. short-term forecasts versus long-term planning.

A dual-approach to forecasting increases the accuracy of long-term forecasts. This implies to have bottom-up and top-down forecasting. That requires an integration of both, the sales forces’ market specific knowledge, and the managements’ overall knowledge on business functions and operations, as well as macroeconomic development.

Reliable and feasible long-term forecasts with high accuracy facilitate a company to have a well-timed production planning, including resource allocation and production and operation management. Furthermore, companies can be more reactive to demand or market changes, and are capable to take product modifications or cancellations into account. Changes within a
specific time frame will definitely cause less harm for a company than sudden cancellations or unnecessary stock production.

All in all it is important to note the importance that all contributors in the forecasting process should be aware of the different needs, as well as of the needs of other organizational functions that work with the information generated from a forecast. As our study reveals, production- and market-side may have different foci in time frames, making it hard to integrate sales forecasts with production-, or budget plans.

It is therefore crucial that the company understands these differences and acts upon them. There is not one way to do forecasting in a company, not one generic solution for all your forecasting needs. Instead, MNCs need to differentiate their forecasting to their different products. Hence, companies have to look at each product group and define what forecasting needs each has. The main argument used so far is the production time, but there are also other factors that influence forecasting needs. Examples are how long a customer is willing to wait for a product, lead times for raw materials, seasonality, and customer service sensitivity. All these factors should be taken into account when defining the forecasting needs of a specific product or product group.
6.3 Research Question 3

Research Question 3
What is the forecasting contributors’ reasoning behind the information added to the forecasting system?

As stated earlier, MNCs that operate in emerging and developing country markets mainly rely on domain knowledge to create their forecasts. Though, it appears evident that this knowledge has to be supported by other sources of information. Domain knowledge is one of many judgmental forecasting methods, a method that allows a company to incorporate existing knowledge and experience into their forecasting procedures.

Our theoretical framework, as well as our empirical findings, shows that judgmental forecasting methods allow for the influence of personnel biases, that are ultimately harming the forecasts accuracy. In order to increase accuracy, and evade personnel bias, the utilization of both judgmental and statistical forecasting methods are preferred. Although some markets, like the ones our case company operates in, differ in the availability of reliable sources of information, companies have to seek to incorporate any obtainable information. This kind of information has to be used to create statistical forecasts, and therefore act as supportive tool for the judgmental forecasts.

Statistical forecasting methods are widely discussed in the theoretical body for sales forecasting. There are various statistical forecasting methods differing in complexity that could be used. The advantage of utilizing statistical forecasting methods is that they provide an unbiased and consistent forecast based on hard historical data.

Hence companies have to benchmark their judgmental forecasting against their statistical forecasting. In case of great differences between judgmental and statistical forecasts, the judgmental forecaster may have to bring up arguments and the reasoning behind the forecast. This facilitates to identify errors, as well as notifies the use of inappropriate methods that need to be changed. Furthermore this could remove some of the biases that are inevitable when utilizing judgmental forecasts.

Another source of knowledge that may influence forecasting is the use of macroeconomic indicators. This type of information can be a great tool to support judgmental forecasts. By utilizing macroeconomic indicators a company can obtain a better understanding of long-term market conditions that is not possible to have when solely using domain knowledge. To make
best use of such indicators, companies have to identify macroeconomic developments that correlate with the development of their products. Appendix 11.13 provides an example of an indicator for one product group of this case company. Such information has to be provided to relevant functions that are involved in the forecasting process, helping them to aggregate a superior set of data.

In general the reasoning behind a short-term and long-term forecast is not different, meaning that the forecaster utilizes the same way of thinking. However, there are differences in the availability of information that is exploited to generate a short-term forecast and a long-term forecast. Generally there is more solid data available for short-term forecasts; such solid data can include orders on hand, projects in the pipeline, and public tenders. Long-term forecasts, on the other hand, rely heavily on overall trends, macroeconomic indicators, seasonality, and the forecasters’ experience. Hence it is reasonable that short-term forecasting tends to be more accurate than long-term forecasting.

What we can conclude is that MNCs operating in emerging and developing countries are very dependent on the access to domain knowledge in the specific market. We explained the different drawbacks of judgmental forecasting methods, and to eliminate these biases or reduce them companies should additionally implement both statistical methods and macroeconomic indicators to support the judgmental forecaster.
6.4 Research Question 4

**Research Question 4**

How do the different forecasting contributors in the organization value the forecasting process?

Forecasting is not always the highest prioritized function in a company. We have identified three important factors that influence the perception of a forecast and also indirectly the motivation towards forecasting. These factors are generic factors that are believed to be true for any company that is dependent on accurate forecasts for the operations. The three factors are:

1. Training
2. Performance Measurement
3. Rewards and Punishment

Training is an aspect of forecasting that is often overlooked by many companies. In fact it is crucial for both the motivation of the forecaster, as well as forecasting accuracy. There are two dimensions of training-needs existing related to forecasting. Either there is a lack of experience or knowledge about the respective industry or the forecasting personnel lacks in an understanding of forecasting methods.

Hence the first task, for any company, is to identify and acknowledge the different training needs and then specify relevant actions. In general people that have some statistical or forecasting background have to gain business experience on how to implement this knowledge in the forecasting practices.

The theoretical framework, as well as our findings demonstrate, that majority of the sales personnel close to the market possess a high level of information about the business environment, yet lacks in statistical or judgmental forecasting education. Training in forecasting methods will supply the forecaster with information about the relevant existing methods. Even more important is the understanding on when and how to use these methods, as well as clarifying their strengths and weaknesses. Through such training, the forecaster is able to choose appropriate methods that support the judgment on the prospect demand. A positive side effect of well-educated forecasters is an enhanced motivation hence superior performance.
In order to be able to recognize an improvement in forecasting practices, companies have to measure their performance. Like training, performance measurement is an aspect that is not always carried out to its full potential. This has been indicated by our empirical findings, and although there is a great awareness of the necessity of performance measurement, the case company has no systematic measurement. There are many ways to measure forecasting accuracy, a simple and common used method is the MAPE. The MAPE method provides an overview of how much the actual sales and the forecasts differ from each other. No matter which measuring technique is employed, it is important that the measuring is done constantly, i.e. every time a forecast is changed. By doing that, the company is able to detect where the forecasting errors are located, making it possible to improve in these areas.

Such measurement not only helps to detect sources of errors, but also makes it possible to provide the forecaster with individual feedback on forecasting performance and development.

Besides the feedback on forecasting performance, people also have to be rewarded. This is often realized via integrating performance measurement into the overall job evaluation of the forecaster. Although some research has revealed that monetary rewards have no effect on forecasting accuracy. However, other research states that reward systems should be linked to the overall reward system of the company. Hence we believe, that MNCs should use some sort of incentive- or reward system can improve the motivation and perception of forecasting. However, it is up to the individual company how to align this best possible to the overall incentive system.
6.5 Main Strategic Question

What can be done to improve the efficiency, accuracy and use of sales forecasting in MNCs’ manufacturing capital investment goods?

The previous discussion on our four research questions focuses on areas that are of great importance for the overall forecasting process. These areas, if considered and realized, may lead to an improvement of a company’s sales forecasting practices.

Figure 40 summarizes our findings and major problem areas in forecasting management, as well as illustrates the four generic stages that we suggest for companies that seek an efficient forecasting process: Knowledge Creation, Knowledge Transformation, Knowledge Use, and Feedback.

Knowledge creation is the first step within this generic process. This stage is related to the creation of the forecast. This creation may either derive directly from the sales personnel or a similar function close to the market. This is highly dependent on the distribution network a company applies. The case company of this study utilizes a highly committed dealer network.
consisting of independent as well as company-owned Dealers. Hence the personnel represent the closest connection to the end-customer. As already stated earlier, the creation phase is highly dependent on the forecaster, to be more precise, the forecasters’ level of domain knowledge about the market he/she is working with. This domain knowledge, among other sources, helps the forecaster to create a reasonable demand projection – the sales forecast.

The next step, termed as Knowledge Transformation, is related to the integration of the bottom-up forecast and the top-down forecast from the management level. After its initial creation, the forecast is verified by a higher authority in the organization, e.g. Sales and Volume Planning. This includes reviews, as well as some adjustments and changes in the forecasted numbers. For these adaptations, the management level utilizes its overall knowledge on business functions and operations, as well as macroeconomic development. Furthermore the management level might have a greater internal knowledge such as about upcoming campaigns, product launches, competitor intelligence etc. After adaptations and changes of the initial forecast, the updated forecast is forwarded to the production-side. This step is the third step and is referred to as Knowledge Use. Here the production planners utilize the forecasted numbers to start production planning, e.g. resources, manpower and all other necessary activities. This planning also involves a capacity-check with the production facilities, sometimes leading to slight adjustments of the forecast.

After the forecast has been created, transformed and used there is only one stage left, i.e. the Feedback stage, which we recognize as the closing-stage of the whole process. Feedback is an essential aspect for any company no matter if it is related to forecasting or other organizational tasks. Without feedback employees are not able to know what they do right and what they do wrong. Hence feedback also contains some kind of performance measurement, making it possible to evaluate the individual forecasters’ performance. Depending on company policy, it might also involve a reward system for forecasting performance. Feedback should be recognized as an ongoing activity throughout the entire forecasting process. In fact, companies should seek to have continuous feedback loops throughout the whole forecasting process, especially after every adjustment or change. Research indicates that there are always areas to improve related to forecasting, nevertheless, companies that do not measure their performance and development will not be able to recognize if they are getting better or worse at forecasting.
After the presented theoretical framework was applied when conducting the case study, some theoretical conclusions have been drawn. The purpose is to present a theory in its entirety that is particularly concerned with the sales forecasting management process as a tool for an MNC. Therefore, this chapter presents the theoretical conclusions, which are compiled as a contribution to science.
7 Theoretical Conclusions as Contribution to Science

In order to improve an MNC’s forecasting process, i.e. efficiency and accuracy of sales forecasts, sales forecasting management has to be clearly understood and exploited. As introduced in the theoretical framework, after an explicit literature research it was realized that there is no recognized theory that describes sales forecasting management as an entity.

Taking a long hard look at forecasting management theory related to its practice reveals that there are several challenges to deal with – related to both theory and practice of forecasting management.

Our research has tried to take a holistic view of sales forecasting, and the main focus of the thesis has been on forecasting management. Even though forecasting management is a known term in the theory, we still think this is an underdeveloped area, compared to other areas in forecasting. There has been a focus on methods and application in the forecasting literature for a long time. However, the need for more forecasting management research is starting to become evident and researchers start to be aware of the need for more research in the field of forecasting management.

“I have long supported the need for more and better work in forecasting that considers the role of organizational arrangements on forecasting practices and performance

(…).”(Breitschneider in Fildes et al., 2003, 28ff)

Breitschneider further argues that this gap in research is also a result of the profession: “If you look at the makeup of researchers who publish in IJF (International Journal of Forecasting) and JoF (Journal of Forecasting), they are predominantly statisticians, econometricians, operations researchers and individuals who are heavily oriented towards methods and techniques.”

We, as researchers, did not have such background and therefore we believe that our results also differ from normal forecasting research. Our main result is a holistic forecasting management model developed for MNCs in the construction equipment industry, or similar. The model mainly consists of four stages with recommendations under each stage backed up by known theory and data from our case company. It has been possible to find other articles that focus on forecasting management who also divide forecasting up into different stages, dimensions or similar. However, we think the focus of these “models” or guidelines has been too much on the creation of forecasts.
We feel that there is a need to take a step back and take a more comprehensive perspective look at the qualitative, managerial aspects of the role of sales forecasting management within an MNCs sales forecasting process – the managerial vein of forecasting.

Hence, we believe that the contribution of this thesis can be seen in two dimensions:

1. By confirming/employing of traditional theories upon which we based our research
2. By the development of a new perspective on sales forecasting management and the creation of a comprehensive forecasting management model

We tried in this research to look at forecasting from a more organizational point of view. The four stages of forecasting we created; Knowledge Creation, Knowledge Transformation, Knowledge Use and Feedback, are, as we believe, unique in the forecasting theory.

We have not been able to discover similar models that have such a simple approach to forecasting and yet keep the focus on the forecasting management. Hence, the first theoretical contribution of our thesis can be seen in summarizing and relating few of the existing theories about forecasting management on the one side with the internal forecasting practices of the case company on the other.

Figure 41: The Pillars of Forecasting Management, (Source: own)

Figure 41 shows the many different theoretical pillars upon which we based our research. These theories and aspects of forecasting were chosen as base, a build-up on which forecasting management emerges as a consequence and development of forecasting science. In addition, our idea was to present the relevant theories and aspects of forecasting, linked with each other and summarized in one way that will fit better with the needs of forecasting management practitioners. In consequence, we constructed the thesis’ theoretical framework.
and the research model showing our overall analytical framework for this thesis. (Please see Figure 41 and Figure 16).

The second contribution can be seen in the development of a new sales forecasting management perspective. This has been done by selecting different approaches to forecasting management found in theory, integrating them in one and modifying them to a comprehensive management model. (Please see Figure 40 on page 148)

We believe that existing theories and aspects on forecasting management lack in the ability to provide the forecaster with an overall perspective on the “managerial vein” of forecasting, helping the forecaster to understand the total forecasting process of the company. Existing theories mostly focus solely on the creation of the forecast, i.e. the different methods that can be applied, and feedback, i.e. performance measurement. These aspects are referred to as Knowledge Creation and Feedback in our model. However, we believe that this approach is not holistic enough to be used as a sufficient instrument for forecasting in an MNC. The missing links, which our model incorporates, are the Transformation and Use of the forecast. These two parameters help to put the forecasting process into a more organizational viewpoint instead of being solely focused on the creation of the forecast. By understanding the relationship between the four stages of our framework for forecasting management, as well as their impact on the application of forecast, MNCs might be able to enhance their forecasting management practices.

The developed framework addresses an important area of forecasting research. All in all we believe that our thesis opens up a new way to think at forecasting by taking a more organizational approach. We believe that it is important that researchers continue to evaluate and improve upon the criteria and framework presented. The experience and perspectives of others who use the criteria and framework in research settings can help to establish a richer understanding of its applicability in different industries and organizational environments, and under different operating conditions. There may also be new criteria that can be added to one or more of the four stages in the framework that will lead to improved forecasting performance. We hope that other researchers see the need for taking forecasting theory from its own island and incorporate it into the wider organizational theory like we believe we did.
This chapter is devoted to our recommendations for VCE Region International. The recommendations are based on the analysis of the forecasting process. Since some of the recommendations are to some extent of an organizational nature, we will not offer a complete description of how they would be actually implemented.
8 Recommendations

8.1 Seven Recommendations for VCE Region International

The recommendations we are suggesting are more than a just non-academic part of the thesis aimed at giving practical recommendations to the case company. The recommendations also aim, to some extent, to provide more specific answers to our strategic question proposed at the beginning of the thesis.

Before going into detail with the recommendations we give an overview of the analyzed gaps predominant in VCE Region International’s sales forecasting process. Figure 42 shows a summary of these gaps. The bigger the bar – the bigger is the gap between the current state and the ideal state. Each parameter will be described in the following pages.

![Figure 42: VCE Region International’s Gap-Model, (Source: own)](image-url)
1. **Start to measure your forecasting effort – taking accuracy serious**

One of the biggest gaps between VCE Region International’s current forecasting process and the normative model derived from theory is the degree of performance measurement.

VCE Region International’s current performance measurement practices exhibit a lot of room for improvements. In fact, performance measurement is virtually non-existent!

However, before being able to measure any kind of performance or accuracy, VCE Region International has to address the following three issues:

1. What is the objective of performance measurement?
2. How can we measure this objective?
3. What degree of accuracy do we want to achieve?

These questions should be answered through a dialogue starting at the forecast contributors and going up to the forecast users. Through this common goal setting, all involved people will have an understanding of the importance and necessity of performance measurement. Hence, dedicate more effort and motivation towards their forecasting practices, which should create a better forecasting performance.

After setting goals and targets of performance measurement, VCE Region International has to choose a measure of accuracy with which the whole organization is comfortable. A recommended type of measurement is the MAPE method, a rather simple method that provides an overview on how much the actual sales and the forecasts differed from each other.

Table 11 on the next page, is a simple example aiming to illustrate how easily the performance measurement could be completed. The used abbreviations have to be understood as the following:

- The first column refers to the month
- AS are the actual sales of that month
- F1 to F12 is the created forecast from 1 to 12 months ago
- FXAPE is the Absolute Percentage Error between forecast X and actual sales
- MAPE: Mean Absolute Percentage Error for forecasting that time frame

This table starts with the AS column indicating the actual sales, and then the last 12 months forecasts for that month. The utilized numbers are fictional; however, our main intention is to demonstrate a simple solution to measure forecasting accuracy. By implementing such
measurements, VCE Region International may get a better understanding of how good they are at forecasting in the different time frames.

Table 11: Example of MAPE calculation, (Source: own)

<table>
<thead>
<tr>
<th>Month</th>
<th>AS</th>
<th>F1</th>
<th>F1APE</th>
<th>F2</th>
<th>F2APE</th>
<th>F3</th>
<th>F3APE</th>
<th>F4</th>
<th>F4APE</th>
<th>F5</th>
<th>F5APE</th>
<th>F6</th>
<th>F6APE</th>
</tr>
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<td>112</td>
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<td>113</td>
<td>1.8%</td>
<td>114</td>
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<td>115</td>
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<td>4.5%</td>
<td>117</td>
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<td>1.5%</td>
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<td>134</td>
<td>3.1%</td>
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<td>136</td>
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</tr>
<tr>
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<td>122</td>
<td>1.7%</td>
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<td>126</td>
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<td>138</td>
<td>1.4%</td>
<td>137</td>
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<td>2.9%</td>
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<td>241</td>
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<td>2.8%</td>
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<tr>
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Table 11: Example of MAPE calculation, (Source: own)

By having a cross-functional approach to performance measurement, a set of multidimensional metrics as well as an incorporated multilevel measurement, VCE Region International has to comprehend the following aspects:

- Measure accuracy whenever and wherever forecasts are adjusted
- Measure forecast accuracy at all levels relevant to the functional areas using the forecast
- Provide both graphical and statistical measures of accuracy
However, we suggest VCE Region International a two-step-approach to measurement, first after the forecast creation at the ASMs, and then after the Demand Review Meeting. By doing this, VCE Region International secures measurement of its bottom-up forecasting activities and its top-down forecasting activities.

Figure 43 shows the recommended levels of performance measurement.

The implementation of performance measurement also makes it possible to compare the accuracy between different markets. Hence, a set of best-practices could be derived allowing contributors to “exchange” their practices and experience. We are aware that VCE Region International’s markets differ in their characteristics and some markets are harder to forecast than others. However, we believe that a benchmark between markets that share similar characteristics is feasible. This might also act as an incentive for the individual forecasters to make progress in their performance as they can see how well they are doing compared to other forecasters!

Another positive side effect of performance measurement is the opportunity to reflect accountability of the forecast. This enables the company to detect weak areas and sources of errors, making it easier to eliminate causes that harm accuracy. Besides detecting weak areas and sources of errors, superior performance can be recognized. Depending on the company’s incentive system, performance rewards could be provided.
By measuring forecasting performance, VCE Region International will definitely be able to have a more efficient and accurate sales forecasting process. Although there are various areas of improvements that need to be incorporated, that might take lots of working hours, we are certain that the end-result will pay-off.

2. Make contributors aware of existing sources of knowledge and make them use it to its full potential!

Although it seems that VCE Regional International’s forecasting contributors have a good set of sources of knowledge, we believe that there is a lack in awareness of other sources - waiting in the market to be analyzed.

Today, there is no systematic way or checklist indicating various sources that are valuable for the forecast creation. We are aware the VCE Region International’s market characteristics differ in a great deal and that these markets do not possess the same amount of data. However, we believe that a checklist that specifies potential sources of information, as well as country specific indicators, can be helpful in the current forecast creation process. As it is today, forecasters have a certain combination of indicators, and other sources of information. We believe that this combination is too definite and people should seek for additional and new sources. By providing a checklist, forecasters can get inspired on what to look for.

VCE Region International has a very large focus on one single forecasting method, i.e. judgmental forecasting. Although it seems logical and correct to utilize a sales force composite to generate the forecasts, we believe that VCE Region International should support this judgmental method with statistical ones. An integration of both statistical and judgmental methods helps to delimitate sources of errors, as well as biases that might occur when putting too much weight on judgmental forecasts!

Evidence shows that VCE Region International’s forecasting contributors possess a great number of time-series. However, this information is solely looked at and not used for statistical analysis. To use these time-series to their fullest potential, forecasters should use some of the statistical methods for analysis. However, it has to be noted that we are not recommending implementing an independent forecasting department. The integration of statistical forecasting methods can be regarded complementary activity, i.e. supporting VCE Region International’s judgmental forecasting activities.
The only statistical analysis done today is the EWI-Report generated by the VPT two to three times a year. In this report leading indicators for specific product groups split up for all markets are identified.

Putting too much emphasis on two methods, i.e. sales force composite and leading indicators, also signifies a lack of risk spreading. Hence the created forecasts are more vulnerable. Instead of exposing their forecast to errors, VCE Region International should use the existing information and exploit more diverse forecasting methods.

3. Provide Forecasting Training and Guidelines

Today, it is mostly the ASMs’ responsibility to decide how to create their forecast. There exist no rules or company guidelines that provide instructions on how to complete the forecast creation. VCE Region International operates in several markets over the world, and forecasts are created for each sub-region. These forecasts are merged to one final forecast for the whole Region International.

We believe that it is very important to have some set of guidelines, indicating which information can be utilized to generate the forecast. This makes it possible to put the same weighting on specific sources of information. Therefore we recommend VCE Region International to create guidelines on which generic sources of knowledge should be used as a base for the forecasts. Such guidelines could indicate for example if the forecaster should start the creation by looking at the total market and the market share, or instead base the forecast on historical sales. To be more precise, we believe that the integration of judgmental bootstrapping in combination with the aforementioned guidelines can be of great value for VCE Region International’s forecasting practices.

Figure 44, on the next page, aims to illustrate how forecasting guidelines or rules may potentially influence the forecast creation. On the left side, the forecast is created without any guidelines or rules. Hence the created forecasts consist of different sources, with different weighting. On the right side, certain rules to compose the forecast as well as the indication of specific weighting of each source enable an equal setting of the forecast.
VCE Region International’s forecasters seem to lack in educational background of statistical and judgmental methods. Considering the importance of forecasting for VCE Region International, there is a clear need for more training. As it seems today, forecasters have a tendency to solely trust in their own judgment when creating a forecast. Therefore we see a clear need to gain information on statistical forecasting knowledge. We believe that it would be most relevant for the VPT, or another central function, to receive more training in statistical forecasting practices. Hence the VPT can provide statistical forecasts to the ASMs and support them in their current forecasting activities. Consequently, the ASMs can combine their judgmental forecasts with the statistical forecast obtained from the VPT. To avoid misinterpretations and ensure that the ASMs can use the statistical forecast to its full value, we also recommend additional training for the ASMs to enable them to understand the provided statistical forecasts. The training for the ASMs could be guidelines on how to use and understand statistical forecasts to support their judgmental forecast.

The importance of using statistics the right way in forecasting is highlighted by the following quote:

“An unsophisticated forecaster uses statistics as a drunken man uses lamp-posts - for support rather than for illumination.” (Andrew Lang, 1844-1912)

A general training that should be implemented in VCE Region International is related to the understanding of the overall forecasting process. Such training should focus on the understanding of how the actual forecast affects other functions in the organization, especially
8. Recommendations

the implications of poor forecasts. We believe that such training could create a stronger connection between the sales- and production-side, as well as removes the trust-issues between the functions.

4. Increase Communication, Cooperation and Collaboration between Functions

The current level of CCC seems rather low, indicating a need for an improvement in the information flow between the involved functions in the forecasting process. All functions within VCE Region International and the Dealers should be able to easily access all data and information they need to create the forecast. This would facilitate a more efficient process.

Therefore, we suggest the creation of a more systemized way to manage the information flow to create a higher degree of knowledge sharing. This can avoid that information, which can be of interest for other functions, gets stuck with a certain function. It has become evident that different contributors, as well as functions, have become too isolated from each other. This creates islands of information and analysis. It seems like different contributors feel that they have more actual or better information themselves about their market. Having too much trust in individual information and disregarding others insights can create huge harm to the forecasting accuracy.

With better two-way communication such problems may not exist. The different contributors would be aware of each other’s information need and could exchange their knowledge. This would also allow a better understanding of each contributor’s reasoning behind their forecasts, as well as deliver insight in sources of knowledge and analyzing methods. Furthermore, the use of a cross-functional approach to forecasting makes it possible to have a shared ownership of the created forecast, ultimately helping VCE Region International to eliminate islands of information/analysis.

5. Identify and Acknowledge different Forecasting Needs

It would be in the interest of VCE Region International to realize and distinguish the forecasting needs for the different functions, but more important for their diverse product groups.

Today, VCE Region International creates a 12-month rolling forecast for all product groups, which is not considering the different planning-needs the different product groups have. There is however, a big difference in each product group’s production requirements. Our research focused on one specific product group, i.e. the Articulated Haulers. As we found out, this type of product relies on long-term forecasts, i.e. starting from three months and forward. Hence
the short-term forecast, upon which the sales-side puts the foremost focus at the current time, is for the production-side more or less irrelevant!

Such differences have to be highlighted and integrated in the forecasting process. Therefore, we suggest VCE Region International to clarify the specific forecasting needs of each product group. A feasible solution, we believe that could suit, is a segmentation of products. Such segmentation could be one of the following exemplars:

- Demand patterns
- Life cycle stage
- Raw material and production order cycles
- Shelf life
- Product value and importance to the company

These different needs should be acknowledged and regarded throughout the whole forecasting process. Such integration could make the forecasting process more efficient, enhance the understanding of the forecasting process, as well as eliminate work-hours to create forecasts that are not really relevant to other functions.

6. Reconcile Bottom-up and Top-down forecasting

It has become evident that VCE Region International currently puts a focus on bottom-up forecasting. This shows the understanding that the contributors closest to the market are the ones who possess the foremost knowledge about local markets, and customer intentions. This awareness is crucial as other contributors higher in the forecasting process will never be able to obtain such information themselves.

However, it has also become evident that VCE Region International makes use of top-down forecasting. To be precise, this top-down approach has the purpose to review and adjust the bottom-up forecast with the knowledge and experience of the management level.

We believe that the current practices, i.e. having both a bottom-up and top-down approach, is a good method to combine existing market specific knowledge with the broader knowledge about macroeconomic factors, as well as knowledge on business functions and operations.

In spite of this we see the need for a real understanding of the benefits of both approaches. VCE Region International should assess when a bottom-up forecast is more appropriate than a top-down forecast. There must be the possibility to change the forecasting approach when necessary, e.g. starting with a top-down forecast and let the ASMs and Dealers judge these
numbers. VCE Region International operates in environments with very volatile demand-patterns. Hence changing markets require a reactive approach to ensure control over the situation.

7. Avoid, and get rid of (potential) Bias

During our research, we revealed four biases that are harming VCE Region International’s forecasting process. The theoretical framework suggests two ways to work with such biases, either the company has to accept them and try to understand their impact on the forecasting activities, or the company tries to remove the bias. In VCE Region International we suggest both methods, in the following paragraphs we describe how to deal with each of the four specific biases.

Optimism and wishful thinking

We do not think it would be possible to remove the optimism from the Dealers and ASMs that are resulting in over-forecasting. This is backed up through our interviews:

“They are salespersons, they need to be optimistic” (VP Sales, Interview)

This means that VCE Region International has to work around this bias. Our theoretical framework suggests that companies should:

- either have a third party creating the forecast
- or having more than one person making an independent forecast.

We suggest VCE Region International to choose the second suggestion. As stated in recommendation 2, VCE Region International should enhance its use of statistical analysis. By doing this, as well as by providing the ASMs and Dealers with statistical forecasts on their specific market, optimism can be lowered. Therefore it would work as a perfect balance to the biases from the ASMs and Dealers.

Inconsistency

Inconsistency is a bias that is occurring when the forecasters are not able to apply the same decision criteria’s in similar situations. Hence VCE Region International should try to formalize a decision-making process, indicating what to do in specific situations. Although such a decision-making process might be hard to implement, we recommend VCE Region International to initiate at least forecasting guidelines or rules. As already stated in recommendation 3, such guidelines are helpful in finding a balance and avoid too different forecasting practices.
Bias of History

We also described the bias of history in our empirical findings, and this bias is not explained in the theory but rather our own definition of a current problem in VCE Region International. Because there have been huge fluctuations in the construction equipment industry the production has not always been able to deliver the needed amount of units to the different Dealers. This creates an atmosphere where people over-forecast to ensure the delivery of needed units. This belief is what we call the bias of history.

This bias is enhanced by the fact that the Dealers have no incentive to create a forecast as accurate as possible. Therefore they over-forecast because that means easier access to machines. At the current time VCE Region International has no incentive- or punishment scheme to reward/punish their forecasters for their forecasting accuracy. However, we believe that VCE Region International can get rid of this problem by making it clear to all contributors what consequences wrong forecasts or under- and over-forecasting have on the overall company performance. Hence, we suggest increasing the communication between all stakeholders, allowing all forecasting contributors to get a better understanding of the overall picture of the forecasting process.

Availability

All empirical findings indicate that some of VCE Region International’s forecasting contributors rely too much on specific information and events, leading to the exclusion of other pertinent information. This bias is closely tied to our second recommendation, i.e. make all contributors aware of existing sources of knowledge and make them use it to its full potential.

In this context, and to avoid this bias, we recommend VCE Region International to put focus on:

- Presenting complete information available on markets, though try to provide the contributors with a condensed and easy understandable manner,
- Presenting all sides of the situation and information considered.

The reason why VCE Region International should remove or work with these biases is that they create an environment that allows for game-playing. This creates a situation, where forecasters are not motivated to create the most accurate forecast, but rather the most appropriate for themselves.
In this last chapter we give suggestions for future research. During our own study we came across several areas and new problems, we did not have the opportunity and time to investigate. We believe that these suggestions could be of interest for both VCE Region International, and for the university level.
9 Suggestions for Further Research

Experimental Research Approach on VCE Region International’s forecasting

The area of forecasting is wide and consists of many different methods. Our research approach was based on a case-study, because of the reasons mentioned in the methodology chapter.

However, for a researcher with more time available, it would be recommendable to start an experimental research on the same type of MNC as we did. This research could center on the implementation of different methods of forecasting, hence aiming to evaluate their applicability and usefulness for an MNC like VCE Region International. Such research could be of great interest for both the theoretical field, as well as the company in focus.

Today, there exists a lot of research on methods and their applicability, but solely few cases related to real life. An interesting question for such an experimental research could be how valuable statistical forecasting for emerging and developing countries is in reality.

Forecasting in Emerging and Developing Country Markets

Furthermore, we see a need for more specific research into the field of forecasting in emerging and developing country markets.

For this thesis we have taken it for granted that emerging markets need a higher degree of domain knowledge. However, we believe that it would be very interesting to do a more in-depth study on an institutional analysis for emerging country markets with a focus on forecasting. Such research would hopefully help to reveal which forecasting method fits with specific emerging markets the best. Moreover, we believe that such research could also aim to identify specific market indicators for emerging markets and how these differ from more developed country markets.
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10 References

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VCE Region International: Company Presentation 2009.

Other Internal Presentations and Reports from VCE Region International

*Internet Sources*

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APPENDIX
11 Appendix

11.1 Case Study Protocol
11.2 Interview Guidelines for VCE Region International

The purpose of this interview is to obtain information regarding the interviewees’ view on the current forecasting practices at VCE Region International. Moreover, we aim to obtain the interviewees opinions about their experiences when developing a forecasting and when working with the new forecasting system.

The interview starts with an introduction of the interviewee: professional background and position within the company as well as about responsibilities and activities concerning the forecasting process.

After that, we focus on gaining insight into and extensive understanding of the forecasting process and practices at VCE Region International. This step also involves areas like forecasting motivation, responsibilities, and employed methods/techniques to create a forecast. Then, we continue focus on different aspects of forecast creation, and the use of forecasts for production planning. Finally, we discuss the current training and feedback performance at VCE Region International.

1. Description of the current forecasting process
   - Forecasting versus Planning
   - The interviewees’ role in the process
   - The overall motivation and operational (sales) targets
   - Efficiency & Accuracy
   - Weaknesses & Strengths
   - Sources of Errors
   - SAP 4C system

2. The creation of a forecast
   - Sources of Information
   - Macro- vs. Microeconomic Data
   - Methods/Techniques for collecting / creating a forecast
   - Differences in short-, mid- and long-term forecasting
   - Rules & Guidelines
   - Inter-organizational communication
   - Accuracy of a forecast

3. The use of forecasts for production planning
   - Lead-Times for articulated haulers
   - Short-, mid- and long-term forecasting versus production planning
   - Flexibility of production planning
   - Flexibility of production capacity
   - Inventory Planning

4. Training and Feedback Practices
   - Training on forecasting techniques and the new system
   - Formal / informal feedback personal performance
   - Follow-up meetings
11.3 Questionnaire for VCE Region International’s ASMs

Introduction to Respondents

Respondent:

Brief introduction to your job and responsibilities:

Questions on General Forecasting and the Forecasting Process
1. Could you please describe your current forecasting process?
2. How efficient do you perceive this process?
3. What are the major weaknesses of the current forecasting process?
4. What are the major strengths of the current forecasting process?
5. Are you satisfied with the present forecasting practices at VCE Region International?
6. How do you perceive your role in the forecasting process?
7. What is your contribution to the forecasting process?
8. How do you perceive the importance of forecasting to VCE Region International?
9. How do you distinguish between forecasting and planning?
10. Do you think people mix the terms planning and forecasting?
11. How do you perceive the overall motivation for forecasting? If necessary, how would you improve the motivation?
12. How does a sales target influence your actual forecast?
13. How is forecasting included in your job description?
14. How would you describe the communication within the forecasting process?
15. Could you please state the person who is responsible for the entire forecasting process?
16. Where do you see room for improvements in the current forecasting process?
17. What are the main sources of forecasting errors in your opinion?
18. How do you assess the efficiency of doing forecasts for all countries within a region in regards of production planning?

Questions on the SAP 4C System
1. What was the reason for implementing the new system?
2. How is it to work with SAP 4C?
3. What are the strengths of the system?
4. How do you perceive the weaknesses of the system?
Questions on “Knowledge Creation”

Information Collection

1. What kind of information do you base your forecast on?
2. How do you collect the data used for the forecast?
3. What kind of historical information do you use when generating a forecast?
4. How are previous sales numbers integrated in your forecast creation?
5. What kind of macro-economic data do you use to produce your forecast?
6. What are the differences in doing a long-, mid- or short-term forecast?
7. How would you evaluate your “special” knowledge about markets used for a forecast?
8. How would you evaluate your “special” knowledge about customers used for a forecast?
9. How do you distinguish between small and big customers / markets?
10. How would you weight your knowledge-level of big key-customers and smaller customers?
11. How much time do you invest when generating a forecast?
12. What do you see as major factors influencing the accuracy of a forecast?
13. What reasoning is behind short-term forecasting compared to mid-term forecasting?
14. What reasoning is behind short-term forecasting compared to long-term forecasting?
15. What rules or guidelines do you follow when developing a forecast?
16. How is your forecast later used at other levels of the organization?
17. What are the actions to avoid wrong forecasts?
18. To what degree do you consider forecasting activity as a managerial importance in your region?
19. To what degree do you see forecasting as a high- or low value adding process?

Information Communication

1. What kind of support do you receive from other contributors within the organization?
2. Who supports you in your data collection process?
3. How often do you communicate with other contributors of forecasting process?
4. How do you share your (market / customer) knowledge with other people in the organization?
5. How do you interact with other Dealers/ASMs to discuss the forecast?
6. How often do you talk to your customers?
7. How do you forward the forecasted numbers to the headquarters?
8. How accurate are you at forecasting?
9. With what tools do you measure your forecasting accuracy?
10. What kind of feedback do you receive on the forecasting accuracy?
11. To what extend are personal bonuses and the accuracy of a forecast interlinked?

**Questions on Feedback**

1. How often do you receive feedback on your forecasting performance?
2. What kind of feedback would you appreciate?
3. How are follow-up meetings organized at VCE Region International?
4. What topics and subjects are discussed in those meetings?
5. What kind of forecasting training did you receive?
6. How often did you receive this training?
7. What was the agenda of such training?
8. How does the systematic communication between contributors in the forecasting process look like?

**11.4 Questionnaire for VCE Region International’s VPT**

**Introduction to Respondents**

Respondent:

Brief introduction to your job and responsibilities:

**Questions on General Forecasting and the Forecasting Process**

1. Could you please describe your current forecasting process?
2. How efficient do you perceive this process?
3. What are the major weaknesses of the current forecasting process?
4. What are the major strengths of the current forecasting process?
5. Are you satisfied with the present forecasting practices at VCE Region International?
6. How do you perceive your role in the forecasting process?
7. What is your contribution to the forecasting process?
8. How do you perceive the importance of forecasting to VCE Region International?
9. How do you distinguish between forecasting and planning?
10. Do you think people mix the terms planning and forecasting?
11. How do you perceive the overall motivation for forecasting? If necessary, how would you improve the motivation?
12. How does a sales target influence an actual forecast?
13. How is forecasting included in your job description?
14. How would you describe the communication within the forecasting process?
15. Could you please state the person who is responsible for the entire forecasting process?
16. Where do you see room for improvements in the current forecasting process?
17. What are the main sources of forecasting errors in your opinion?
18. How do you assess the efficiency of doing forecasts for all countries within a region in regards of production planning?

**Questions on the SAP 4C System**
1. What was the reason for implementing the new system?
2. How is it to work with SAP 4C?
3. What are the strengths of the system?
4. How do you perceive the weaknesses of the system?

**Questions on “Knowledge Creation”**
1. How would you evaluate your “special” knowledge about markets used for a forecast?
2. How would you evaluate your “special” knowledge about customers used for a forecast?
3. What do you see as major factors influencing the accuracy of a forecast?
4. What reasoning is behind short-term forecasting compared to mid-term forecasting?
5. What reasoning is behind short-term forecasting compared to long-term forecasting?
6. What rules or guidelines do you follow when developing a forecast?
7. What are the actions to avoid wrong forecasts?
8. How often do you communicate with other people integrated in the forecasting process?
9. How do you communicate with other people integrated in the forecasting process?
10. How do you share your (market / customer) knowledge with other people in the organization?
11. To what extend are personal bonuses and the accuracy of a forecast interlinked?

**Question on “Knowledge Transformation”**
1. What steps are involved when transforming a forecast to a plan?
2. What kind of internal factors do you use to transform a forecast?
3. How do you use market information to transform a forecast?
4. How do you use competitor information to transform a forecast?
5. How do you use pricing information to transform a forecast?
6. To what extend are functional areas integrated when creating a forecast?
7. How does the creation of a forecast and a business plan influence each other?
8. What influence has a production-, logistic-, or marketing-plan on a forecast?
9. How do you integrate bottom-up forecasts and top-down forecasts?
4. What topics and subjects are discussed in those meetings?
5. What kind of forecasting training did you receive?
6. How often did you receive this training?
7. What was the agenda of such trainings?
8. How does the systematic communication between contributors in the forecasting process look like?

11.5 Questionnaire for VCE Region International’s S&OP Leaders

Introduction to Respondents
Respondent:

Brief introduction to job and responsibilities:

Questions on General Forecasting and the Forecasting Process
1. How efficient do you perceive VCE Region International’s current forecasting process?
2. Could you identify certain weaknesses and/or strengths of the forecasting process?
3. Are you satisfied with the present forecasting practices at VCE Region International?
4. How do you perceive your role in the forecasting process?
5. What is your contribution to the forecasting process?
6. How do you perceive the importance of forecasting to VCE Region International?
7. How do you distinguish between forecasting and planning?
8. Do you think people mix the terms planning and forecasting?
9. How do you perceive the overall motivation for forecasting?
10. If necessary, how would you improve the motivation?
11. How is forecasting included in your job description?
12. What rules or guidelines related to forecasting do exist at VCE Region International?
13. How would you describe the communication within the forecasting process?
14. Could you please state the person who is responsible for the entire forecasting process?
15. How do you share your (market / customer) knowledge with other people in the organization?
16. What kind of support do you receive from other contributors within the organization?
17. How does the systematic communication between contributors in the forecasting process look like?
18. What kind of feedback do you provide the contributors in case of adjustments or changes?
19. What kind of information do you base these adjustments on?
20. Where do you see room for improvements in the current forecasting process?
21. What are the main sources of forecasting errors in your opinion?
22. What do you see as major factors influencing the accuracy of a forecast?
23. To what degree do you consider forecasting activity as a managerial importance in your region?
24. To what degree do you see forecasting as a high- or low value adding process?

Questions on the SAP 4C System
1. What was the reason for implementing the new system?
2. How is it to work with SAP 4C?
3. What are the strengths of the system?
4. How do you perceive the weaknesses of the system?

Question on “Knowledge Use”
1. How long is the lead-time between an order and actual delivery of an articulated hauler?
2. How valuable is the forecasting in the different time-frames you receive? For example, how valuable is the forecast for January if you are already in December?
3. How flexible is the actual production related to changes in the forecast?
4. How flexible is the production related to the different times forecasting frames?
5. How do you do your inventory planning?
6. How do you assess the efficiency of doing forecasts for all countries within a region in regards of production planning?
7. How do you perceive the accuracy of the forecast you receive?
8. What possibilities do you see in order to bring down inventory levels and stock?
9. How would you describe the linkage between forecasting accuracy and inventory levels?
10. Could a more accurate forecast bring down inventory levels?

Questions on Feedback
1. How often do you receive feedback on your forecasting performance?
2. What kind of feedback would you appreciate?
3. How are follow-up meetings organized at VCE Region International?
4. What topics and subjects are discussed in those meetings?
5. What kind of forecasting training did you receive?
6. How often did you receive this training?
7. What was the agenda of such training?
11.6 Functional Integration

### Forecasting Benchmark Stages: Functional Integration

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stage 1</strong></td>
<td></td>
</tr>
</tbody>
</table>
- Major disconnections between marketing, finance, sales, production, logistics, and forecasting  
- Each area has its own forecasting effort  
- No accountability between areas for forecasting accuracy |
| **Stage 2** |  
- Coordination (formal meetings) of marketing, finance, sales, production, logistics, and forecasting  
- Forecasting located in certain area (typically operations or marketing), which dictates forecasts to other areas  
- Planned consensus meetings, but dominated by operations, finance, or marketing – no real consensus reached  
- Performance rewards for forecasting personnel only, based on contribution to department in which forecasting is housed |
| **Stage 3** |  
- Communication and coordination between marketing, finance, sales, production, logistics, and forecasting  
- Existence of a forecasting champion  
- Recognition that marketing is a capacity-unconstrained forecast and operations is a capacity-constrained forecast  
- Consensus and negotiation process to reconcile marketing and operations forecasts  
- Performance Rewards for improved forecasting accuracy for all personnel involved in consensus process |
| **Stage 4** |  
- Functional integration (collaboration, communication, and coordination) between marketing, finance, sales, production, logistics, and forecasting  
- Existence of forecasting as a separate functional area  
- Needs of all areas recognized and met by reconciled marketing and operations forecasts  
  - Finance = annual dollar forecasts  
  - Sales = quarterly dollar sales-territory-based forecasts  
  - Marketing = annual dollar product-based forecasts  
  - Production = production cycle unit SKU (stock keeping unit) forecasts  
  - Logistics = order cycle unit SKUL forecasts (stock keeping unit by location) forecasts  
- Consensus process recognizes feedback loops (e.g., constrained capacity information is provided to sales, marketing, and advertising, which can drive demand)  
- Multidimensional performance rewards for all personnel involved in consensus process |

Table: Forecasting Benchmark Stages: Functional Integration, (Source: Mentzer et. al, 1999: 49)
## 11.7 Approach

<table>
<thead>
<tr>
<th>Forecasting Benchmark Stages: Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stage 1</strong></td>
</tr>
<tr>
<td>• Plan-driven, top-down forecasting (failure to recognize its interaction with marketing and business planning)</td>
</tr>
<tr>
<td>• Only shipments forecast</td>
</tr>
<tr>
<td>• All forecasted products treated the same</td>
</tr>
<tr>
<td>• Naïve or simple statistical approach, often with little understanding of techniques or environment (“Black Box Forecasting”)</td>
</tr>
<tr>
<td>• Failure to see role of forecasting in developing business plan (viewed solely as tactical function)</td>
</tr>
<tr>
<td>• No training of forecasting personnel in techniques or understanding business environment; no documentation of forecasting process</td>
</tr>
<tr>
<td><strong>Stage 2</strong></td>
</tr>
<tr>
<td>• Bottom-up, SKUL-based forecasting</td>
</tr>
<tr>
<td>• Forecast self-reported demand (recognized by the organization) or adjusted demand (invoiced-keyed)</td>
</tr>
<tr>
<td>• Recognition that marketing efforts and seasonality drive demand</td>
</tr>
<tr>
<td>• Recognition of relationship between forecasting and business planning, but plan still takes precedence</td>
</tr>
<tr>
<td>• Limited statistics training; little understanding of business environment; limited documentation of forecasting process</td>
</tr>
<tr>
<td><strong>Stage 3</strong></td>
</tr>
<tr>
<td>• Both top-down and bottom-up forecasting</td>
</tr>
<tr>
<td>• Forecast POS demand and back information up supply chain, and/or key customer demand information (“uncommitted commitments”)</td>
</tr>
<tr>
<td>• Use of ABC analysis or some other categorization for accuracy</td>
</tr>
<tr>
<td>• Identification of categories of products that do not need to be forecast (two-bin items, dependent demand items, make-to-order items)</td>
</tr>
<tr>
<td>• Use of regression-based models for higher-level (cooperate to product line) forecasts and time-series models for operational (product to SKUL) forecasts</td>
</tr>
<tr>
<td>• Importance of subjective input from marketing, sales, and operations</td>
</tr>
<tr>
<td>• Forecasting drives business plan</td>
</tr>
<tr>
<td>• Training in quantitative analysis/statistics and environment</td>
</tr>
<tr>
<td>• Strong management support for forecasting process</td>
</tr>
<tr>
<td><strong>Stage 4</strong></td>
</tr>
<tr>
<td>• Top-down and bottom-up forecasting, with reconciliation</td>
</tr>
<tr>
<td>• Vendor-managed inventory factored out of process</td>
</tr>
<tr>
<td>• Full forecasting segmentation of precuts (ABS, two-bin, dependent demand, make-to-order, product value, seasonality, customer service sensitivity, promotion-driven, life cycle stage, shelf life, raw material lead time, production lead time)</td>
</tr>
<tr>
<td>• Understanding of “game playing” inherent in sale force and distribution channel (motivation for sales to under forecast and distributors to over forecast)</td>
</tr>
<tr>
<td>• Development of forecasts and business plan simultaneously, with periodic reconciliation of both</td>
</tr>
</tbody>
</table>
Ongoing training in quantitative analysis/statistics and business environment; top management support of forecasting process

(Source: Mentzer et al., 1999: 51)

11.8 Systems

<table>
<thead>
<tr>
<th>Forecasting Benchmark Stages: Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stage 1</strong></td>
</tr>
<tr>
<td>• Corporate information systems, forecasting software, and distribution requirement planning systems are not linked electronically</td>
</tr>
<tr>
<td>• Printed reports; manual transfer of data from one system to another; lack of cooperation between information in different systems</td>
</tr>
<tr>
<td>• Few people understand systems and their interaction (all system knowledge held in information systems)</td>
</tr>
<tr>
<td>• “Islands of analyses” exist</td>
</tr>
<tr>
<td>• Lack of performance metrics in any of the systems or reports</td>
</tr>
<tr>
<td><strong>Stage 2</strong></td>
</tr>
<tr>
<td>• Electronic links between marketing, finance, forecasting, manufacturing, logistics, and sales systems</td>
</tr>
<tr>
<td>• On-screen reports available</td>
</tr>
<tr>
<td>• Measures of performance available in reports and in the system</td>
</tr>
<tr>
<td>• Reports periodically generated</td>
</tr>
<tr>
<td><strong>Stage 3</strong></td>
</tr>
<tr>
<td>• Client-server architecture that allows changes to be made easily and communicated to other systems</td>
</tr>
<tr>
<td>• Improved system user interfaces to allow subjective input</td>
</tr>
<tr>
<td>• Common ownership of databases and information systems</td>
</tr>
<tr>
<td>• Measures of performance available in reports and in the system</td>
</tr>
<tr>
<td>• Reports generated on demand/performance measures available online</td>
</tr>
<tr>
<td><strong>Stage 4</strong></td>
</tr>
<tr>
<td>• Open-system architecture means all affected areas can provide electronic input to the forecasting process</td>
</tr>
<tr>
<td>• EDI linkages with major customers and suppliers to allow forecasting by key customer and supply chain staging of forecasts (real-time POS forecasts to plan key customer demand ahead of supply chain cycle)</td>
</tr>
</tbody>
</table>

(Source: Mentzer et al., 1999:54)
11.9 Performance Measurement

<table>
<thead>
<tr>
<th>Forecasting Benchmark Stages: Performance Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stage 1</strong></td>
</tr>
<tr>
<td>• Accuracy not measured</td>
</tr>
<tr>
<td>• Forecasting performance evaluation not tied to any measure of accuracy (often tied to meeting plan, or reconciliation with plan)</td>
</tr>
<tr>
<td><strong>Stage 2</strong></td>
</tr>
<tr>
<td>• Accuracy measured, primarily as MAPE, but sometimes measured inaccurately (e.g., forecast, rather than demand, used in the denominator of the calculation)</td>
</tr>
<tr>
<td>• Forecasting Performance evaluation based on accuracy, with no consideration for the implications of accurate forecasts on operations</td>
</tr>
<tr>
<td>• Recognition of the impact on demand of external factors (economic conditions, competitive actions)</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
</tr>
<tr>
<td>• Accuracy still measured as MAPE, but more concern with measuring supply chain impact of forecast accuracy (lower acceptable accuracy for low-value products, recognition of capacity constraints in supply chain and their impact on forecasting and performance, etc.)</td>
</tr>
<tr>
<td>• Graphical and collective (throughout the product hierarchy) reporting of forecast accuracy</td>
</tr>
<tr>
<td>• Forecasting performance evaluation still based on accuracy, but with more recognition that accuracy affects inventory levels, customer service, and marketing and financial plans</td>
</tr>
<tr>
<td><strong>Stage 4</strong></td>
</tr>
<tr>
<td>• Realization that exogenous factors affect accuracy and that unfulfilled demand is partly a function of forecasting error and partly of operational error</td>
</tr>
<tr>
<td>• Forecasting error treated as indication of the need for a problem search (e.g. POS demand was forecast accurately but plant capacity prevented production of the forecast amount)</td>
</tr>
<tr>
<td>• Multidimensional metrics of forecasting performance; performance evaluation tied to the impact of accuracy on achieving corporate goals (e.g., profitability, supply chain costs, customer service)</td>
</tr>
</tbody>
</table>

(Source: Mentzer et. al, 1999: 55)
11.10 VCE Product Range
11.11 VCE Region International’s Sub-Regions

**Latin America & Cuba**
- 20 Countries
- 28 Independent Dealer
- 1 Volvo owned Dealer
- Employees based in the region ~ 120

**Retail Sales 2008**
- 3,050 Units
- Share of region International: 30 %

**Africa**
- 40 Countries
- 14 Independent Dealers
- 1 Volvo Owned Dealer
- Employees based in the region ~ 15

**Retail Sales 2008**
- 2,015 Units
- Share of region International: 20 %

**Russia, Ukraine & Belarus**
- 3 Countries
- 3 Independent Dealer
- 1 Volvo owned Dealer
- Employees based in the region ~ 240

**Retail Sales 2008**
- 1,547 Units
- Share of region International: 15 %
<table>
<thead>
<tr>
<th>Region</th>
<th>Countries</th>
<th>Independent Dealers</th>
<th>Employees based in region</th>
<th>Retail Sales 2008</th>
<th>Share of region International</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkey &amp; Central Asia</td>
<td>8</td>
<td>5</td>
<td>~85</td>
<td>649 Units</td>
<td>6 %</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Volvo owned Dealer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle East</td>
<td>13</td>
<td>14</td>
<td>~7</td>
<td>2,018 Units</td>
<td>20 %</td>
</tr>
<tr>
<td>Oceania</td>
<td>4</td>
<td>3</td>
<td>~5</td>
<td>913 Units</td>
<td>9 %</td>
</tr>
</tbody>
</table>

Retail Sales 2008:
- Turkey & Central Asia: 649 Units
- Middle East: 2,018 Units
- Oceania: 913 Units

Share of region International:
- Turkey & Central Asia: 6 %
- Middle East: 20 %
- Oceania: 9 %
11. Appendix

11.12 SAP 4C
11.13 EWI-Report Australia

Early Warning Indicators & Trends

Construction Equipment Market

Australia

Macroeconomic summary

Wheel Loader
Excavator
Backhoe Loader
Artic Hauler
Grader
Compact Excavator

Summary

Macroeconomic summary- Australia

- Economic growth will cool down but still soft landing expected (FC GDP growth 2.8% in 08 and 2.7% in 09)
  - Weaker investor- and consumer sentiment
  - 12-year high interests rates (7.25%), rising borrowing costs, inflationary pressure
  - Tax rebates, low unemployment, buoyant terms of trade
- Current-account deficit record high due to surge import supported by a strong AUD together with lagging volume growth in the export sector caused by insufficient production and infrastructure capacity
- The australian economy so far does not experience any significant affect of the US subprime crisis
Macroeconomic summary - New Zealand

- Economic growth will slow down more markedly in 08, from 3.2% in 07 to 1.0% in 08 and 2.1% in 09.
  - Higher interest rates will significantly decrease household spending
  - Production levels in the agricultural sector still suffering from drought
  - Business investment is set to decrease due to the interest rates increase, rising input costs and the strength of the exchange rate
11. Appendix

Wholesales inventories and TM Wheel loader

Summary TM Wheel loader - Indicators and Trend

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Lead</th>
<th>Corr</th>
<th>2008 (f)</th>
<th>2009 (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composite leading indicator</td>
<td>8</td>
<td>0.58</td>
<td>920</td>
<td>-</td>
</tr>
<tr>
<td>Unemployment</td>
<td>15</td>
<td>0.57</td>
<td>870</td>
<td>870</td>
</tr>
<tr>
<td>Wholesales inventories</td>
<td>18</td>
<td>0.58</td>
<td>920</td>
<td>830</td>
</tr>
<tr>
<td>Consensus Top-Down TM forecast</td>
<td></td>
<td></td>
<td>900</td>
<td>850</td>
</tr>
<tr>
<td>Trend</td>
<td></td>
<td></td>
<td>780</td>
<td>820</td>
</tr>
<tr>
<td>Actual TM 2007</td>
<td>970</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actual TM R12 June 2008</td>
<td>955</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M2 TM forecast</td>
<td>1000</td>
<td></td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>M3 TM forecast</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2010: ??? (M2 = 1100)
Forecast distribution: Select "Resp"

Forecast input: Select "Dealer" then click on macro button

<table>
<thead>
<tr>
<th>Product Line</th>
<th>Dealer</th>
<th>Country</th>
<th>Resp</th>
<th>Prod ID</th>
<th>Type</th>
<th>Plan ID</th>
<th>Act 08</th>
<th>YTD Feb 09</th>
<th>Retail</th>
<th>F03</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>R12</th>
<th>F04</th>
<th>Full Year 2009</th>
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11.15 Flash Report Process

1. Forecasting Desk
   - Notify when retailers are completed in MOM

2. Create Flash Report

3. Market Support

4. Dealer

5. Add end user names
   - Retail dates etc?

6. Market Support

7. Retail machines in MOM
   - Retail machines in MAS

8. Forecasting Desk
   - Update order, loading in main
   - Update MAS, retailers in MAIN
### Report in USD

**TEAM Middle East (= MEA excl IL, TR)**

<table>
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<tr>
<th></th>
<th>Actual in USD</th>
<th>Actual in USD</th>
<th>Actual in USD</th>
<th>F2 2008 in USD</th>
<th>F2 2008 in USD</th>
<th>F2 2008 in USD</th>
<th>Difference between Actual and F2 2008 Ytd Nov</th>
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<td>YTD Nov</td>
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<td>YTD Nov</td>
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**Total excl Road Constr and SDLG**

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<th>Actual in USD</th>
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<td>YTD Nov</td>
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### Forecast follow up on last month’s forecasts

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<th>Deviation Act-ST fest</th>
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**Comments:**
- Main deviation on:
  - WL: Units +10 (Al Marai, SA)
  - AH: Units +7 (Tristar, AE)

- Spare parts
  - Sales +170 TUSD
  - Profit +688 TUSD
### Total incl Road Constr, excl Lingong

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<th>Dec 2008 F0 2008</th>
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<th>Jan09 F0 2009</th>
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<td>67</td>
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- Low margin on machines in Dec. due to 91 units being Hepco and rollers (low margin products)
- Hard to forecast shipments due to dealers financial problems
- GM for Parts improving
11. Appendix

11.17 Comparison VCE Region International’s market vulnerability

**Oceania - Haulers**

![Graph showing market share and total market units for Oceania over time.]

**Turkey and Central Asia - Haulers**

![Graph showing market share and total market units for Turkey and Central Asia over time.]

---

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The University of Kalmar has more than 9000 students. We offer education and research in natural sciences, technology, the maritime field, social science, languages and humanities, teacher training, caring sciences and social service.

Our profile areas in research are: biomedicine/biotechnology, environmental sciences, marine ecology, automation, business administration and informatics, but we have research proceeding in most subject areas of the University.

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at the university of Kalmar
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