Data as Intelligence
A Study of Business Intelligence as Decision Support

Civilekonom thesis within Business Administration
Author: Rebecka Karlsson
Supervisor: Karin Brunsson
Jönköping May 2013
Abstract

Introduction: The term Business Intelligence arose in the mid-1990s and is a growing share of the IT market. The need of Business Intelligence emerges from an increasing competition and a constantly changing and more complex business climate.

Problem discussion: There are only few examples of research dealing with data-driven decision processes. How data are incorporated in decision making processes is crucial for the future use of decision support systems. The literature stress that managers must use more analytics and rationality to make better and more appropriate decisions. However, previously studies have indicated that intuition still plays a major role in decision making, even in organizations using Business Intelligence. With this background the following research question is presented:

To what extent are Business Intelligence systems used to support decisions in organizations?

Purpose: The purpose of this study is to describe and observe Business Intelligence from a decision making perspective.

Method: The primary source of data is personal interviews and one observation study, which implies a qualitative method. The respondents are an organization in the start-up phase, IT-consultants and suppliers and current Business Intelligence users. An abductive approach is applied, and the analyses of data is done simultaneously as the examination of literature and previously made studies.

Findings: The system is mainly used for producing reports and as a provider of information. More information and more detailed information are accessible due to the Business Intelligence system. The information itself is valued highly, it is assumed that if the decision maker has enough of information, an appropriate decision will be made. Intuition is still frequently used among the users, yet the Business Intelligence system can to some extent neutralize the user. This is due to that the system is used to confirm and follow up the intuition.
# Table of Contents

## 1 Introduction
- 1.1 Background ................................................................. 1
- 1.2 Problem Discussion .................................................. 3
  Problem Formulation ...................................................... 4
- 1.3 Purpose .................................................................. 4
- 1.4 Delimitations ............................................................... 4
- 1.5 Definitions ................................................................. 4

## 2 Method
- 2.1 Research Design ...................................................... 6
- 2.2 Research Approach .................................................... 6
- 2.3 Data Collection .......................................................... 7
  Implementation of Personal Interviews ................................ 7
  Outline of Interview Questions ........................................ 8
  Observations ................................................................. 8
- 2.4 The Validity of the Study .............................................. 9

## 3 Presentation of Respondents
- 3.1 Respondents to 'The need of Business Intelligence' .......... 10
- 3.2 Respondents IT-Consultants and Suppliers .................... 10
- 3.3 Respondents to 'Business Intelligence Users' .................. 11

## 4 Frame of Reference
- 4.1 What is Business Intelligence? ................................. 13
  How Business Intelligence Can Create Value ................. 14
- 4.2 Business Intelligence and Analytics .......................... 15
  Competing on Analytics ................................................ 15
  From Data to Knowledge and From Knowledge to Intelligence ........................................... 17
  The Impact of the User .................................................. 18
- 4.3 The Process of Decision Making ............................... 19
  How Humans Make Decisions ........................................ 19
  The Organizational Perspective ...................................... 20
  IT as Decision Support .................................................. 21
  Business Intelligence and Rational Decision Making .......... 21
- 4.4 Concluding Remarks ................................................ 22

## 5 Empirical Findings
- 5.1 The Need of Business Intelligence ............................. 23
  Current Management Accounting .................................... 23
  Problems with Current Management Reporting ............... 24
  Expectations of Business Intelligence ............................. 24
- 5.2 The Perspective of IT-Consultants and Suppliers .......... 26
  The Definition of Business Intelligence ............................ 26
  The Value of Business Intelligence ................................ 26
  The Respondents' View of the User ................................. 27
  What is Analysis? .......................................................... 27
  Change in Behavior ...................................................... 29
  Business Intelligence as a Decision Support System .......... 30
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.3</td>
<td>The Perspective of the Users</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>The Usage of Business Intelligence</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Business Intelligence and Decisions</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>How Decision Support Has Improved</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Business Intelligence and Intuition</td>
<td>36</td>
</tr>
<tr>
<td>6</td>
<td><strong>Summarizing Analysis</strong></td>
<td>37</td>
</tr>
<tr>
<td>6.1</td>
<td>Analytical Thinking</td>
<td>37</td>
</tr>
<tr>
<td>6.2</td>
<td>Organizations as Chaotic</td>
<td>38</td>
</tr>
<tr>
<td>6.3</td>
<td>The Value of Information</td>
<td>39</td>
</tr>
<tr>
<td>6.4</td>
<td>Decision Making</td>
<td>39</td>
</tr>
<tr>
<td>7</td>
<td><strong>Conclusion</strong></td>
<td>41</td>
</tr>
<tr>
<td>8</td>
<td><strong>Discussion</strong></td>
<td>42</td>
</tr>
<tr>
<td>8.1</td>
<td>Future Research</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td><strong>List of references</strong></td>
<td>43</td>
</tr>
</tbody>
</table>

*Figure 1, Business Intelligence component framework, Eckerson (2003).... 14*
*Figure 2, The Landscape of Analytics, Eckerson (2003)......................... 16*
*Figure 3, Business Intelligence as data refinery, Eckerson (2003)............ 17*

*Appendix 1, Interview guide – Future users*
*Appendix 2, Interview guide – IT-consultants and suppliers*
*Appendix 3, Interview guide – The users*
I Introduction

The French president Georges Pompidou is reputed to have said:

“There are three routes to failure: gambling, sex and technology. Of these the first is the quickest, the second the most pleasurable and technology the most certain” (Feeny & Willcocks, 2000, p. 301. Cited in Nilsson & Sellnäs, 2006)

Nevertheless, most people would consider technology as a valuable asset, and IT as crucial for organizations operations. Organizations invest huge amounts of money in IT, for example is the Swedish market of IT predicted to grow with 2.3 billion SEK to 154.7 billion SEK during 2013 (Radar Ecosystems Specialists'). Ever since the ‘Relevance lost’ debate, introduced by Norton and Kaplan in the 1980’s, there has according to Burns & Scapens (2000) been a debate of whether management accounting has changed, or has not changed, or should change. Yet, Burns & Scapens (2000) conclude that the environment in which management accounting is practiced has changed due to development in information technology, changing business climate and new management practices.

Business Intelligence systems represent a growing share of the market. According to The Analyst Technologies (2013) the market of Business Intelligence will grow with 10.5 % during 12 months (June 2012-June 2013), and Business Intelligence is the area where most companies aim to make an IT-investment during the upcoming year. However, it becomes crucial to consider human decision making when studying Business Intelligence since this is an IT-solution that to a large extent aims to support managerial decision making. So which impact does technology have on managerial decisions?

March (1987) concludes that traditional conceptions of choice are insufficient and sometimes even misleading for designing an information system. Similarly, theories of human decision making and choice, for example the research by Khaneman (2003) and March (1987), indicate that humans are often not aware of how decisions actual are made. As Davenport, Harris, De Long & Jacobsen (2001) describe;

“The decision making process itself, largely invisible within the minds of managers, is difficult to understand, document, or improve... There has been a tendency for organizations to treat managerial decision making as a ‘black box’, subject to neither explanation nor review” (p.131)

1.1 Background

The term Business Intelligence was introduced by a group of it-consultants in the mid-1990s but the concept of decision support system has existed since the early 1970’s (Turban, Aronsson, Liang & Sharda, 2007). Turban, Aronson & Liang (2005), quoted in Frolick & Ariyachandra (2006), define Business Intelligence as following;

“A broad category of applications and technologies for gathering, storing, analyzing, and providing access to data to help enterprise users make better business decisions.” ( p. 42)
Eckerson (2003) describes Business Intelligence as a data refinery; data shall be extracted, transformed and loaded into a data warehouse from which users can extract information. Within the literature it is assumed that the user is able to translate the data into knowledge and intelligence and thereby make better decisions. However, Zuboff (1985) states that technology is never neutral and in the end it depends on the individual and his/her ability to fully exploit the possibilities given by the technology.

The need for Business Intelligence does according to Davenport (2006) emerge from increasing competition. The business climate is constantly changing and becoming more and more complex (Turban et al. 2007). This development requires managers to react and respond quickly, which in turn requires that the managers are able to interpret their environment. Davenport (2006) argues that in a highly competitive environment where all industries offer similar products and possess equal technical equipment, the remaining source of differentiation is the business processes. IT investments can create business value through their direct impact on business processes, since IT software is developed to support internal processes (Elbashir, Collier & Davern, 2008). There will be a strategic advantage if the organization manages to fully exploit its Business Intelligence system and ensure that the system actually provides business value (Williams & Williams, 2003).

A Business Intelligence system is often adopted to optimize and enhance the investment in an ERP system (Elbashir et. al, 2008), since ERP systems are by some considered as more appropriate for data warehousing and transaction processing but less suitable for delivering the information for reporting and analyzing purposes (Booth, Matolesy & Wieder, 2000; Granlund & Malmi, 2002; Rom & Rhode, 2006; Scapens & Jazayeri 2003). Nevertheless, Simons (2008) claims that the most significant reason for investing in a Business Intelligence system, is the aim to improve decision making. According to Davenport et al. (2001) the problem is not that the decision-makers lack data, thanks to the ERP system they are overwhelmed by data but they do not have the ability to aggregate and analyse them and thereby create business value. In a survey from Massachusetts Institute of Technology (referred to in Lindvall, 2013) it is indicated that more than 60 percent of the managers experience that they have more information than the can incorporate in their operations.

Davenport et al. (2001) state that most companies are unable to translate data into intelligence and thereby create business value. This is confirmed by Nilsson & Sellnäs’ (2006) study on Swedish companies and their usage of the Business Intelligence system. Nilsson & Sellnäs (2006) conclude that Swedish organizations do not exploit the full potential of their Business Intelligence systems; in addition they are not as analytical as they could be. This inability to fully exploit the system is not unique for individual organizations, as one IT-consultant in this study observes;

“There are few organizations that distinguish from the rest; I think I would say individual companies are quite similar to other companies in the same situation. But they are in no sense bad. However, if an organization would manage to exploit the full potential of the system it is highly probable that that organization would be far from the others pretty fast...You will be able to beat your competitors pretty fast, due to the fact that the rest are not brilliant either.”
This quote suggests that the capability of the users still is low in general and Davenport, Harris & Morison (2010) suggest that most organizations using Business Intelligence are stuck in the information stage which would imply that the system is used mostly to produce reports. Davenport et al. (2010) argue that this is due to the fact that organizations do not manage to create insights out of the retrieved information. However, the quote above indicates that an improved capability, although just slightly, is considered to create large benefits for the organization. The research by Davenport et al. (2001) also indicates that this in no sense is impossible for organizations to achieve.

1.2 Problem Discussion

The rapid development of the IT sector has contributed to an infinite amount of software solutions and opportunities for organizations to achieve a better information flow and collect more data. The problem seems to be that organizations lack competence to adapt a more analytical approach (Davenport et al. 2001), which has been confirmed by previous studies. When it comes to research in the field of data and how they can be translated to knowledge, the decision making process has been neglected. There are only a few examples of attempts dealing with data-driven decision processes (Davenport et al. 2001). Whether or not managers are able to incorporate data in their decision making processes is crucial for the future use and potential for decision support systems. As Davenport et al. (2001) say;

*Decisions may be based on high-quality, well-analyzed data, or managers may gather data and not use it, or gather it, analyze it, and make decisions based on unrelated factors. However, if the results of data analyses are not used to inform decisions, then what is the point of capturing and managing the data in the first place?”* (p.131)

Lindvall (2013) asks if the need for more detailed information actually is founded in a ‘true’ need, or if it is just an expression for something that feels good to know.

Business Intelligence systems are developed from traditional and ideological conceptions of how humans make decisions and assume a rational user and a rational decision maker (Lindvall, 2013). However, the rational decision is not likely to occur in practice, and Lindvall (2013) therefore concludes that the many examples of failed attempts with Business Intelligence are due to the built-in assumption of a rational user. Davenport et al. (2010), on the other hand, argue that to make better decisions and more appropriate actions, organizations need to use more analytics and rationality and be less guided by intuition. Nevertheless, a study by Andersson, Fries & Johansson (2008) concludes that intuition still plays a major role in decision making even when the organization uses a Business Intelligence system.

Few studies are recent made, it might therefore be reasonable to argue that the users of decision support systems might have increased their ability over time. The customer of Business Intelligence system might be more educated and informed nowadays and perhaps the market has reached a more mature state. It might also be the case that the Business Intelli-
gence systems are developed and implemented from another perspective, with a more realistic view of how humans make decisions.

**Problem Formulation**

With this background the following research question is presented:

*To what extent are Business Intelligence systems used to support decisions in organizations?*

To answer the research question it is also relevant to include how the system is used in general and which information is retrieved. The following sub questions have been used to answer the main research question:

- How is the Business Intelligence system used in organizations?
- Which information is retrieved from the system and for which kinds of decisions is the information used?
- Which role does intuition play in the decision making process?

**1.3 Purpose**

The purpose of this study is to describe and observe Business Intelligence from a decision making perspective.

**1.4 Delimitations**

This study takes the perspective of the user and is limited to manufacturing companies.

The data sources in this study are an organization in the start-up phase, IT-consultants and current Business Intelligence users. The purpose with this is to capture as many perspectives as possible and to achieve a nuanced picture.

**1.5 Definitions**

**Business Intelligence** – A conceptual framework for decision support. It combines architecture, data warehouse, analytical tools and applications.

**Data warehouse** – A centralized storage of data. Connected to a user interface and provides cleaned data in a standardized format.

**Decision Support System** – An umbrella term to describe any IT-system that supports managerial decision making.

**Drill-down** – To go from an aggregated level down to very detailed level, for example from total sales down to sales by region, product or salesperson.

**ETL-process** – The process of extracting data from several sources, convert it into appropriate format and load into a data warehouse. The letter stands for extracting, transform and load.
**Enterprise Resource Planning System** – A business system which is considered as a transactional system. Shortened ‘ERP’.

**Key Performance Indicators** – A financial and non-financial measurement of organizational performance. Shortened ‘KPI’.

**Management Information System** – An IT-system that applies any type of decision support tool or technique to managerial decision making.

**Metadata** – Data describing other data.

**Rationality** – Rational decisions are fully informed, perfectly logical and aim toward maximum economic gain. Referred to as ‘perfect rationality’.

**User Interface** – A visual presentation of data, could for example be graphs and figures. Also called dashboard.
2 Method

The aim with this thesis is to describe and observe how individuals use the Business Intelligence systems, how they interpret information given by the system and how it can be used as a decision support. A qualitative method has therefore been chosen since Jacobsen (2002) argues that this is the most appropriate when the researcher aims to explain how humans interpret and understand a given situation. In the qualitative method the researcher aims to provide a nuanced picture of the problem and seek the relationship between the individual and the context. Since Zuboff (1985) argues that technology never is neutral but always part of a social context, it would be reasonable to conclude that the qualitative method is appropriate when observing how individuals use technology and IT.

2.1 Research Design

In the qualitative method the research process is not fixed but interactive (Bryman & Bell 2011; Jacobsen 2002). The problem formulation can be adjusted along the study and the data can be assayed simultaneously with the data collection, which also has been the case in this thesis. Jacobsen (2002) suggests that due to the openness of the qualitative method the researcher do not limit the observations to an in advance determined structure, but are retentive to new information provided through the sampling. In this study the problem formulation has been changed several times as new information and perspectives have been retrieved, which can be considered to be in line with Jacobsen’s (2002) argumentation. According to Jacobsen (2002) this would result in a study with high internal validity since the researcher comes near the ‘true’ understanding of a phenomenon or event when not being fixed to a predetermined structure but open to new information and perspectives.

2.2 Research Approach

The inductive approach implies according to Jacobsen (2002) that the researcher observes the reality without any expectations or limitations. This approach has nevertheless been criticized for being unrealistic; Jacobsen (2002) argues that the researcher always will be limited since the human mind is not able to collect all relevant information and the researcher will therefore be limited to his or her own translation of reality. Alvesson & Sköldberg (2008) also criticize the perspective of studies as being either deductive or inductive and argue that when it comes to case studies the abductive approach is the most commonly used.

The abductive study is a combination of the inductive and deductive since it starts with empirical facts but not to neglect theoretical conceptions. The analysis of the data can be done simultaneously, or be preceded, by examination of the literature and previously made studies. However, Alvesson & Sköldberg (2008) argue that this shall not be done as a mechanical application on individual events and observations but as inspiration to explore patterns in the data and gain understanding. The abductive approach is therefore probably the most suitable alternative to describe the process of this study. Alvesson & Sköldberg (2008) further suggest that the abductive approach implies an interchange between empiricism and theory and a constant reconsideration of the relationship between them. This study has
been preceded as a process where theories have been reconsidered and in some cases rejected along with the data collection. In addition new literature and theories have been examined and added to achieve a better and deeper understanding.

2.3 Data Collection

The primary source of data in this study is personal interviews. These interviews were carried out early in the research process which is in line with the inductive method according to Jacobsen (2002). The material from the interviews was compared to the literature and the theoretical framework has to some extent been developed simultaneous as the empirical part of this thesis. As preparation for the interviews literature concerning interview technique has been studied and taken into account, for example Brunsson & Holmblad (1999) and Ekholm & Fransson (2012).

Reviewing the literature and previous studies was the starting point for this thesis, both to be able to formulate an adequate research question but also to create a basic understanding of the topic and a first conception of the phenomena. In this thesis the search for literature and the writing of the theoretical framework has been done simultaneous as the data collection.

For a closer presentation of the respondents, see chapter 3 “Presentation of The Respondents”.

Implementation of Personal Interviews

17 corporations have been contacted with a request of participation in this study. In total ten interviews with eleven respondents from eight different corporation have been performed. Six of the interviews were made face-to-face and the remaining four have been carried out over telephone, in some cases the respondents have clarified certain aspects or answered additional questions over email. According to Jacobsen (2002) it might be better to perform face-to-face interviews due to the fact that humans to a large extent communicate through body language and that it therefore might be relevant to observe the behavior of the respondent during the interview. The aim with this study was to carry out all interviews as face-to-face interviews but due to geographical distances and rescheduling in the last minute this aim was not possible to fulfill.

The context and environment affect the respondent and the interview, Jacobsen (2002) therefore argues that the best alternative is to hold the interview in an environment that is well known for the respondent. If the respondent is placed in an unknown and new environment it is most likely that this will affect the answers given and how the respondents behave. In this study all face-to-face interviews have taken place in the respondents’ office or working place which can be considered as a quite known and familiar place for the respondent.

All interviews have been recorded and later on transformed into written text. The translation into written text has been done nearly verbatim. Important and relevant portions of
the interviews have been listening through several times to ensure that my translation and interpretation is correct.

**Outline of Interview Questions**

In the literature, several types of interviews can be distinguish, for example Bryman & Bell (2011) present three types of interviews; structured, semi-structured and unstructured. According to Jacobsen (2002) a structured interview would be when the questions are determine in advance and following a certain order while an unstructured interview would be more like an open conversation.

According to Bryman & Bell (2011) the qualitative interviewing tend to be more flexible than the quantitative and allows the researcher to depart from a predetermine structure. In the semi-structured interview the researcher has developed an interview guide on specific topics to be covered but might not follow the exact order of the questions and might add new questions that follow up something the interviewee replies. In the semi-structured interview the researcher might even change the wording of questions.

With this in mind, it is reasonable to argue that the interviews in this study are semi-structured. An interview guide has been developed (see appendix 1,2 and 3) but has mostly been used as a foundation and support during the interviews. The respondents have been allowed to talk quite freely during the interviews and without being significantly monitored. In some of the interviews the questions have been more structured and in line with the guide, this has been dependent on the personality of the respondent and the contact between the respondent and the interviewer. The interview guide has nevertheless been used as a checklist in the end of the interview to ensure that all the relevant topics and questions have been brought up. Those respondent who have been open and fond of talking have been allowed to speak more freely, and in the end it has most often turned out to be that the respondent have answered most questions without me asking them. In those situations there has been no reason to interrupt the respondent to ask questions. In some cases the wording of the question has been changed and also that words, definitions and expressions has been exchanged to those the respondent is using (refers to words with similar meaning). The reasons for this have been to make the respondents more comfortable by using words that they understand and are familiar with and to give an impression of consensus.

**Observations**

An observation study has been carried out on the first corporation in the presentation of respondents, also called Corporation A (see Chapter 3). This observation study took place in Malmö during a workshop held by the IT-corporation who has got the mission to create a demo on a Business Intelligence solution for Corporation A. In other words, there exists a business relationship between these two groups. 11 persons were present, nine persons from Corporation A and two IT-consultants and most of the participants had met before but some had not.

One problem with participating observations is according to Jacobsen (2002) that the researcher can cause effects that were not there from the beginning. In observations the
presence of the researcher is always an extraneous element, the researcher are a visitor and an unknown element in the environment the researcher aim to observe. This might have an effect on the respondents and their behavior. Yet, in this situation my presence can be argued to have had a minor effect since the whole situation was unknown for the respondents. They did not know the rest of the group very well and not either the IT-consultants and in addition the workshop was held in a, for them, unknown environment.

2.4 The Validity of the Study

As mentioned above Jacobsen (2002) argues that the qualitative approach most often implies a high internal validity since the researcher can be considered to come close to the ‘real’ true. This is also confirmed by Bryman & Bell (2011) who argue that the internal validity can be viewed as one of the strengths with qualitative method. On the other hand, the external validity is viewed as one of the major weaknesses of the qualitative approach (Jacobsen, 2002; Bryman & Bell, 2011). The external validity refers to if the findings can be transferred to other contexts or if the conclusions are general. Due to intensive studies on a small sample size with limited numbers of industries represented, it would be hard to argue that the external validity of this study is high. The selected respondents might not be representative for the whole population and the qualitative method therefore suffering from a generalization problem. However, a large part of the empirical material consists of interviews with IT-consultants and suppliers which would increase the external validity. These respondents have experiences from a high numbers of clients and different industries and would be able to provide a generalized picture.

Similarly, it might be important to consider the credibility of the data sources used. According to (Jacobsen, 2002) it is crucial to evaluate if the respondents have own interests that might influence their answers and information given. One aspect of consideration in this study has been that the IT-consultants and suppliers might be unwilling to describe Business Intelligence in a negative manner and that the respondents in this category have self-interest in the future demand of Business Intelligence systems. However, my experience is that the respondents have been able to describe the negative aspects of the systems as well, at least when it is connected to the incapability of the user and not to the system itself. Arguments and statements which can be considered as clear marketing and/or sales pitches have been sorted out and are not included in the study. Yet, situations like this have not occurred to any larger extent.

Another consideration is that there is a risk that the users of the system are unwilling to share negative experiences and aspects of the Business Intelligence system, since the respondents might fear that the interviewee will interpret this as a failure or an indication of non-profitable investment. To avoid this all interviews with users have been individual and all respondents have been given the opportunity to be anonymous which some of the respondents have preferred to be. To ensure the credibility of the data sources, independent respondents have been selected. Information from several independent sources should according to Jacobsen (2002) provide a valid description of an phenomena or event.
3 Presentation of Respondents

The following presentation of respondents and participating corporations is divided into three sections, these sections equal the structure of the empirical part of the thesis. The first part of respondents has contributed to the first part of the empirical part and so on. Some corporations and respondents have asked to be anonymous which means that the information about them is limited.

3.1 Respondents to ‘The need of Business Intelligence ’

The corporation is a manufacturing company which to 96 % is owned by investment company and listed on Nasdaq OMX. The company is divided into ten ‘business areas’ which is most often by country, and some business areas also have several subsidiaries. In addition to the business areas there are four group-wide support functions.

The main customer is direct consumer and retailers, which represent 70 % of sales, while the remaining 30 % is the industrial sector. The turnover was 5.1 billion SEK in 2011 and the profit 407 million SEK. From 2005 to 2011 the sales increased from 2.2 billion to 5.1 billion SEK, the target is to have a turnover of 10 billion SEK by 2014. The major market is in Northern Europe. This company is referred to as Corporation A.

The respondents below were present during observation study in Malmö and mentioned in the empirical part of this thesis. In addition, two respondents were interviewed individually; the controller of Business area B and the chief accountant of the Parent company.

<table>
<thead>
<tr>
<th>Corporation/Business Area</th>
<th>Title of the respondent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent Company</td>
<td>Chief accountant</td>
</tr>
<tr>
<td>Parent Company</td>
<td>Project leader of BI-project and controller</td>
</tr>
<tr>
<td>Business area A</td>
<td>CFO</td>
</tr>
<tr>
<td>Business area B</td>
<td>Business controller - sales</td>
</tr>
<tr>
<td>Business area B</td>
<td>Production Leader</td>
</tr>
<tr>
<td>Business area C</td>
<td>IT-specialist</td>
</tr>
</tbody>
</table>

3.2 Respondents IT-Consultants and Suppliers

Pdb

Pdb is designing, implementing and integrating IT-systems such as ERP systems and Business Intelligence systems. Pdb was founded in 1983 and has now approximately 100 employees, with offices in Jönköping and Stockholm. The major customer is manufacturing companies but Pdb also works with corporations within the trading, transport and service sector.
Stratiteq

Was founded 2004 and located in Malmö with 70 employees. Stratiteq is specialist within Customer relationship management, Business Intelligence and other tools and applications for organizing and sharing information.

Sogeti

An international company with 21 offices and 1150 employees in Sweden, the interviewed respondent comes from an office located in Borlänge. Sogeti levels at both private and public sector and has for example county councils as customers. The company designs, develops and administrates IT-systems and applications, and has specialists within several areas.

Tacticus

Operates within business development, Business Intelligence and IT-systems such as ERP and other applications. Founded 2006 and has offices in Malmö, Halmstad, Göteborg and Stockholm with approximately 60 employees. Tacticus’ primary customers are manufacturing, distributional and trading corporations.

All respondents from these corporations have long experience within the IT-sector as well as in Business Intelligence. Interviewed respondents:

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Corporation</th>
<th>Title of the respondent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Henrik Borg</td>
<td>Tacticus</td>
<td>Business Area Manager BI &amp; Senior Consultant</td>
</tr>
<tr>
<td>Jonas Gummeson</td>
<td>Sogeti</td>
<td>BI-architect &amp; national coordinator for BI</td>
</tr>
<tr>
<td>Anders Hagberg</td>
<td>Pdb</td>
<td>Key Account Manager</td>
</tr>
<tr>
<td>Thomas Schiffer</td>
<td>Stratiteq</td>
<td>Senior Consultant</td>
</tr>
<tr>
<td>Daniel Strånge</td>
<td>Pdb</td>
<td>BI-architect</td>
</tr>
</tbody>
</table>

3.3 Respondents to ‘Business Intelligence Users’

Corporation B

It is a manufacturing company with 2000 employees and operations in 20 countries. Listed in Nasdaq OMX. The company is divided into four business areas, which are sorted by geographical areas, and three product areas. The turnover of 2012 was 3.85 billion SEK and the profit of 2012 was 251.5 million SEK. The company has seven production entities. From 2008 to 2012 the turnover has increased from 2.77 billion SEK to 3.85 billion SEK. The major customers are the industry and public sector together with retailers, the major market is Northern Europe.

The Business Intelligence solution is limited to the Nordic countries. The company of scope is using the Business Intelligence system in all areas except human resources and production, in the production division only productivity is measured by the system.
Corporation C

It is a manufacturing company with operations in 95 countries and 26 production entities. The global entity has 3500 employees, while the Swedish company consists of 853 employed. The company is divided into three product areas. The major customers are the infrastructure and the industry sector. The turnover was 1584 million SEK in 2011.

The Business Intelligence system is limited to the two plants of the Swedish company and is mostly used by the finance department.

Corporation D

It is a manufacturing company and listed on Nasdaq OMX. The corporation consists of three business areas that are divided by geographical area. Major markets are North America and Europe. The turnover was 3.8 billion SEK and the profit 1.6 billion SEK in 2012. From 2008 to 2012 the turnover decreased from 3.2 billion SEK to 3.8 billion SEK. The major customers: retailers who sell to direct consumer and professional users. The entity has 15430 employed.

The Business Intelligence system is well integrated and used in all areas except in human resources.

Interviewed respondents:

<table>
<thead>
<tr>
<th>Corporation</th>
<th>Title of the respondent</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Purchasing Manager - Trading</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Financial Controller - Corporate</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Financial Controller - Sales, Responsible for the BI-system</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Supply Coordinator</td>
<td></td>
</tr>
</tbody>
</table>
4 Frame of Reference

This chapter aims to provide a theoretical foundation and first insight into the topic. The first section will describe some fundamentals of Business Intelligence and how it is supposed to create value for an organization. The second section will introduce the concept of analytics and is to a large extent based on the frameworks of Thomas H. Davenport and others. These frameworks have a strong focus on Business Intelligence in combination with the use of analytics, since Davenport considers analytics as a foundation of Business Intelligence. The third section will introduce theories of human decision making and theories of rational decision making, central frameworks in this section are Simon’s concept of ‘bounded rationality’ together with March’s ‘limited rationality’.

4.1 What is Business Intelligence?

Business Intelligence as a concept emerged in the mid-90’s and was introduced by the Gartner group, which is a group of IT-consultants (Turban et al., 2007). Turban et al. (2007) consider Business Intelligence as an ‘umbrella term’ or as a ‘content-free expression’, which implies that it means different things to different people. Davenport & Harris (2007) conclude that the whole field of decision support systems is sometimes referred to as Business Intelligence, while Negash (2004) argues that Business Intelligence as a concept has replaced terms such as decision support system and management information system. Turban et al. (2007) argue that Business Intelligence as term evolved from the decision support systems of the 1970s.

There are several definitions of the term ‘Business Intelligence’.

“Business Intelligence software is a collection of decision support technologies for the enterprise aimed at enabling knowledge workers such as executives, managers, and analysts to make better and faster decisions.” (Chaudhuri, Dayal & Narasayya, 2011, p.88)

“BI systems combine data gathering, data storage, and knowledge management with analytical tools to present complex internal and competitive information to planners and decision makers.” (Negash, 2004, p.178)

“A broad category of applications and technologies for gathering, storing, analyzing, and providing access to data to help enterprise users make better business decisions.” (Turban, Aronson & Liang, 2005, quoted in Frolick & Ariyachandra, 2006, p. 42)

The process of extracting, cleaning, transforming, transferring and loading transaction data into the data warehouse is called the ETL-process, and is central in Business Intelligence.

Eckerson’s (2003) model on the next page, highlights several important aspects. First, a Business Intelligence system can extract data from several other internal operational systems as well as external data and information. When the data have been extracted and cleaned, it will be loaded into a data warehouse. By using analytical tools the user will be
able to ‘ask questions’ on the data in the data warehouse and for example group data in different manners.

![BI Component Framework](image)

Figure 1, Business Intelligence component framework, Eckerson (2003)

The difference between transactional systems\(^1\) and Business Intelligence systems is according to the website of Oracle (2013) that Business Intelligence systems are designed for query and analysis rather than transaction processing. This also becomes clear when considering Eckerson’s (2003) model, where the analytical environment has a prominent role. Transactional systems are suitable for data input but Business Intelligence systems are more suitable for retrieving the data, since the system allows the user to determine which information to retrieve and how it shall be filtered (IBM Cognos, 2013).

**How Business Intelligence Can Create Value**

Business Intelligence can according to Elbashir et al. (2008) affects supplier/partner relationships, internal processes efficiency and customer intelligence. According to Elbashir et al. (2008) the supplier/partner relationships can benefit from a Business Intelligence system through the reduction of transaction costs and coordination such as higher responsiveness to and from suppliers and improved inventory turnover. The internal processes will be more effective with reduced operational costs.

The customer intelligence is very often cited in the Business Intelligence literature, for example in Elbashir et al., 2008; Lindvall 2003 and Williams & Williams 2003. The benefits highlighted in the study of Elbashir et al. (2008) are; a better understanding of customers’ habits and buying behavior, predictions of customers’ future demands and a reduction of the time taken to develop and deliver new products. It is also claimed that Business Intelligence support customer segmentation which makes it possible to distinguish profitable

---

\(^1\) Transactional systems could for example be Enterprise resource systems (ERP) or Online transaction processing (OLTP) systems
customers from non-profitable customers and range customers based on their value (Elbashir et al., 2008; Williams & Williams, 2003).

Lindvall (2013) argues that the total profitability of the company is often strongly dependent on a few customers. It is often assumed that the profitability of customers follows a normal distributed curve, in other words is bell-shaped, but according to Lindvall (2013) this is not true in reality. The true visual outcome is closer to the shape of a banana or a whale. Lindvall (2013) explains this difference by the fact that customers are demanding and consuming different resources. If the price is determined through an ordinary calculation with a standard profit increment, the result would be that some customers constantly subsidize other customers since the total actual cost for satisfying customers is different from customer to customer. Lindvall (2013) argues that more detailed information would make these facts visible and that the correlation between cause and effect can be strengthened.

**Business Intelligence Provides Information**

To be able to store large amounts of data, the data warehouse has traditionally been placed at a high level in the central system, for example in the general ledger (Lindvall, 2013). The more detailed information has been saved in separated, independent IT-systems that have not been integrated with the central system. The information available in the central system is often aggregated and without details. If the user needs more specific and nuanced information, for example data on individual products instead of data on product groups, it often requires a lot of work and time to achieve according to Lindvall (2013). Lindvall (2013) therefore argues that one of the benefits with a Business Intelligence system is the possibility to drill-down to detailed level.

**4.2 Business Intelligence and Analytics**

In the literature there is an extensive focus on the connection between Business Intelligence and analytics for example in the framework of Lindvall (2013); Davenport & Harris (2007) and Davenport et al. (2010). The common perspective is that analytics and analytical thinking is the key to turn data into knowledge and intelligence, through analysis the numbers shall become something ‘more’. Yet, the way to achieve this is to some extent unclear within the literature.

**Competing on Analytics**

Several authors draw a connection between Business Intelligence and statistical modeling techniques such as predictive models. According to Lindvall (2013) these predictive models might enable an earlier reaction on weak but early signals on issues and risks that may give large consequences in the future. Lindvall (2013) claims that this will result in improved management, since the ability to capture early indications will enable a better control and monitoring of the operations.
The idea behind Davenport & Harris’s (2007) analytical decision making is that decisions based on analytics are more likely to be correct, or be correct to a larger extent, than decisions based on intuition. Davenport & Harris (2007) define analytics as;

“…the extensive use of data, statistical and quantitative analysis, explanatory and predictive models, and fact-based management to drive decisions and action.” (p. 7)

The definition of analytics by Davenport’s & Harris’s (2007) can be connected to the traditional definition of rationality. The argument is that it is better to know something than to feel, believe or think something even if a quantitative analysis is dependent on a number of assumptions as well. According to Lindvall (2013) the aim with analytics is to, with the help of data, contribute to better decisions and more appropriate actions within the organization.

According to Eckerson (2003) organizations will benefit more from the Business Intelligence system if the users are able to move from the reporting stage to the analytical stage. Davenport et al. (2010) also claim that most organizations using Business Intelligence are stuck in the information-oriented area and do not manage to create insight out of information. Similarly, Eckerson’s (2003) study confirms that the most frequently use consists of viewing paper and/or online reports together with creating reports from predefined criteria, in other words, a report showing only predetermined variables. To create ‘what if’ analyses or forecasts and to build reports from scratch is less common as is the use of statistical models (Eckerson, 2003). As seen in the model below, Eckerson (2003) differs between strategic/tactical analysis and operational analysis, and argues that report vs. monitoring consists of 75 % of the use.

![Figure 2, The Landscape of Analytics, Eckerson (2003)](image)

To be more analytical would according to Eckerson (2003) be to move from ‘What happened?’ to analyse ‘Why did it happen?’, to predictive analysis ‘What will happen?’, to monitoring and follow up with ‘What just happened?’. If the organizations manage to fol-
low this path they will move further on the scale and achieve higher analytical sophistication.

**From Data to Knowledge and From Knowledge to Intelligence**

The data retrieved from systems, applications and the data warehouse must somehow be translated to be useful in decision making and analytics. Within the literature there are several model and suggestions of how this can be done.

![Diagram of Business Intelligence as data refinery](image)

Figure 3, Business Intelligence as data refinery, Eckerson (2003)

Eckerson (2003) illustrates Business Intelligence as a ‘data refinery’. When the data have been extracted and loaded into the system, the user can analyses the data through certain analytical tools. The aim is to identify trends, patterns and exceptions and Eckerson (2003) argues that this analytical phase allows the user to turn information into knowledge. Out of this knowledge you can create decision rules, for example ‘order 50 more units whenever the inventory falls below 100 units’, or forecasts and predictions. The rules can be highly complex and based on statistical algorithms and models. Examples of statistical rules would be to automatically adjust prices in response to changed prices on raw material, or to identify cross-selling opportunities by using data on customer response.

When these rules are implemented the user will gain experience and can reevaluate the rules. The user might have launched a campaign to a certain customer segment, based on a prediction of how customers will respond to certain offers, or the result of previous campaigns. Eckerson (2003) argues that this behavior becomes a cycle which repeats itself and makes the organization into a learning organization. When results constantly can be reviewed and evaluated, the organization will gain knowledge and insight of their own business (Eckerson, 2003).

To create knowledge and intelligence out of data is referred to as ‘intellective skills’ by Zuboff (1985). These intellective skills consist of three dimensions; the ability to think abstractly, inductive reasoning and the ability to have a theoretical conception in mind. Zuboff (1985) argues that the ability to think in abstract terms plays a role since a computerized
environment implies more abstract elements and that the physical actions are eliminated by
the IT-system. Tasks used to be performed through physical and concrete activities but are
now performed through pushing a button. The user must understand what happens when
the button is pushed and be able to relate the data to the ‘real’ activities and processes, and
according to Zuboff (1985) this requires an ability to think abstractly. The second dimen-
sion is inductive reasoning and Zuboff (1985) explains it as the ability to determine poten-
tial relationships between variables and the use of data to build and test hypothesis.

“People learn how to organize data in their minds. They build models in their heads
about what is really happening, and they build on the model with data until they have a
complete picture” (Zuboff, 1985, p. 11, quoting a system engineer)

The inductive reasoning is according to Zuboff (1985) related to the ability to keep a theo-
retical conception in mind. If you are about to generate hypothesis on the data you must
have some frame of reference. The information system contains a huge amount of data and
the user must therefore know what is significant to be able to determine it. Zuboff (1985)
argues that the more of a theoretical conception the user has in mind, the more infor-
mation will be discovered in the data.

The Impact of the User

The ability to use the analytical software will always be possessed by the user (Davenport &
Harris, 2007) and in the end it depends on the individual and his/her ability to fully exploit
the possibilities given by the technology (Lindvall 2013; Zuboff, 1985). The analytical activi-
ties can never be automated; according to Davenport et al. (2001) the analytical tools are as
most effective when they are combined with human insight. In addition, Lindvall (2013)
argues the people are more important than the IT-system, the value of the new information
depends highly on how the receiver interprets and comprehends the information.

“Translation through analyses is the critical factor that determines which action-oriented
knowledge that will be available within the organization”. (p.192)

A successful integration of technical tools requires transformed patterns of thoughts and
behaves, it might be necessary to reconsider individual and collective conceptions. To in-
fluence the culture within an organization and change how people think is according to
Kiron & Shockley (2011) much harder than to design a technical tool and develop analyti-
cal expertise. Having a Business Intelligence system will not create value by itself and hav-
ing useful information will not create value either since having the information is not the
same thing as using it (Williams & Williams, 2003).

Lindvall (2013) suggests that to succeed with this the organization must consciously design
a management with focus on analytics in advance, which is confirmed by Davenport et al.
(2001) and Eckerson (2003). According to Lindvall (2013), the result would otherwise be

---

accessibility to a lot of data but data that are impossible to translate into positive and useful knowledge for the end user.

According to Davenport et al. (2001) the employees do not know which data to focus on if the organizations do not manage to formulate a clear strategy. Davenport et al. (2001) therefore argue that it becomes clearer which data and information that is required to fulfill a strategy if the strategy itself is clear and detailed.

### 4.3 The Process of Decision Making

Davenport et al. (2001) argue that the process of decision making is highly influenced by the organizational and cultural contexts, and to strive towards a culture that values decision based on data is therefore important if you want your decision making process to be influenced by data and facts. Within the literature there is also a strong connection between Business Intelligence and decision making, the Business Intelligence systems are somehow aimed for the decision makers which also can be seen in the presented definitions of Business Intelligence in section 4.1. To dig deeper into how humans make decisions and how external information is interpreted is therefore necessary.

#### How Humans Make Decisions

The invisibility and irrationality in the process of decision making makes it a diffuse area to address (Davenport et al., 2001), and traditional theories of choices have been heavily criticized for simplifying the human mind. Simon (1997) concludes that humans act on intended or bounded rationality instead of perfect rationality, since the human mind is limited. Even if the decision maker is intent on making a rational decision, he or she is limited to bounded decisions which aim to satisfy rather than optimize or maximize (Simon, 1997). March (1987) argues that traditional theories are underestimating the ambiguity of choice. Everything cannot be known and decisions are therefore likely to be based on incomplete information concerning the alternatives and consequences (March, 1987). Similarly, it is assumed that the preferences of the decision makers are stable and consistent. However, people do often have conflicting interests and preferences are changing over time. March (1987) states that preferences are expected to form actions and do affect actions but preferences are at the same time affected by experience and consequences from a certain behavior.

According to Kahneman (2003) ideological theories of choice assume that the decision maker seeks utility and select the option providing the highest utility. However, utility cannot be separated from emotions and the feeling of loss; people value losses differently. Kahneman (2003) suggests that out-of-pocket losses are valued higher than opportunity costs which imply that the decision maker can switch from risk averse to risk seeking depending on which emotions the decision evokes. According to Kahneman (2003) the change in wealth seems to be more important for the decision maker than the actual state of wealth.
Kahneman (2003) states that humans are not accustomed to think hard and twice, and are therefore likely to trust an automatically thought when considering a problem. Lindvall (2013) describes that it is hard for the individual to identify and determine human errors of thinking since they are presented as truth. To create meaning humans seek rational explanations for their own behavior and what is going on around us and Lindvall (2013) claims that when these conceptions of the world have been well formulated and defined, it will suppress alternative explanations. In addition, it seems that some thoughts are more accessible than others and that expectation is a strong determinant of accessibility (Kahneman, 2003). The human mind tends to suppress ambiguity and uncertainty and therefore see what it wants to see. Kahneman (2003) states that an observer will automatically put an event into a certain context, and not automatically become aware of alternative interpretations since they will be repressed. Lindvall (2013) also claims that it might be the case that humans seek information that confirms their first conception.

Kahneman (2003) differentiates between intuition and reasoning and defines intuition as ‘System 1’ and reasoning as ‘System 2’. ‘System 1’ implies fast and effortless response, often emotional and automatic, while ‘System 2’ requires more effort and is often more controlled and rule-governed. The ability to doubt and revaluate options is connected to ‘System 2’, Kahneman (2003) expresses it as the: “…ability to think incompatible thought about the same thing.” (p.1454). ‘System 2’ does also have the ability to correct errors.

**The Organizational Perspective**

When it comes to decision making from an organizational perspective, March (1987) describes the real organization as a loosely coupled system with weak connections between problem, solution and action;

“Organizations seem to be loosely coupled systems in which the connections between problems and solutions are obscure, as the connection between means and ends, between action today and action yesterday, and between action in one part of the organization and action in another part. People, problems, solutions and choice opportunities seem to be combined in confusing ways…” (p.157)

This perspective on organization leads March (1994) to conclude that decisions are made to establish meaning and are always made in a context of meaning (March, 1987). Decision making is considered as a highly symbolic and ritual activity and March therefore argues that decision making is much more than just choosing between available alternatives. The interpretation of information and the decision making do to a large extent contribute to the development of meaning according to March (1987). In addition, March argues that the search for information is not driven by the uncertainty of alternatives or consequences but by a general lack of meaning.

Similarly, Simon (1997) concludes that not only the behavior of the individual but the behavior of organizations is boundedly rational.
**IT as Decision Support**

Simon (1977) describes decisions as a continuum between non-programed (unstructured) and programed (structured) decisions. Structured decisions are often repetitive and routine, and an organization can therefore determine a certain process for handling this type of decision. Examples of structured decisions are according to Simon (1977) pricing customer orders while an example of an unstructured decision would be the decision to establish in a new market. Unstructured problems are often detailed and complex and therefore require extra effort.

Davenport et al. (2001) use the same terms as Simon (1977) and refer to highly structured and unstructured but use ‘questions’ instead of ‘decisions’. The most simply question, called highly structured, can according to Davenport et al (2001) be answered and analysed by the decision maker alone if he or she have access to the data. Yet, in unstructured questions the question itself is not clearly defined and the variables are not defined or determined. In this case, the decision maker might therefore not be able to find accurate data even if they have access to the database. The most common type of question in analytical situations is semi-structured, Davenport et al. (2001) describe it as a series of iterative steps that refine and approximate the need of decision makers. The result of a semi-structured process often occurs as a model or simulation, and it might therefore be possible to automate due to its structured and routine characteristics. However, semi-structured processes require a lot of effort both from analysts and decision makers and it seems to be that the analytical process never becomes routine but more on an ad-hoc level. According to Turban et al. (2007) IT-systems can support semi- and structured decisions but unstructured decisions can only be supported to some extent.

The research by Mezias & Starbuck (2003) indicates that decision makers do not rely only on data; this is due to the fact that data do not capture all variables of importance. Mezias & Starbuck (2003) argue that decisions makers tend to put data into a context build up by their own perceptions and with the aim to make sense out of the data.

**Business Intelligence and Rational Decision Making**

Lindvall (2013) conclude that unsuccessful attempts with decision support systems are due to the ambition to implement traditional and rational theories of decision making. The Business Intelligence solutions are according to Lindvall (2013) implemented with the aim of being rational as in the decision making theory. The systems should be developed from a bounded rationality perspective instead, since it is closer to how decisions are taken and acted upon in reality (Lindvall 2013). March (1987) also claims that theories of choice, game theory and statistical decision theory are in some sense useful but are incomplete and even potentially misleading when it comes to modifying the design of IT systems. However, Eckerson’s (2003) study indicates that users who consulting data more than intuition and use data to support intuition rather than the other way around, is more likely to succeed with a Business Intelligence project.
Since the decision making process is characterized by ambiguity, Lindvall (2013) stresses the role of the Business Intelligence system as sense maker. The need for translation and identification of the organizations values, expectations and conceptions do according to Lindvall (2013) become more important than mathematical and statistical calculations. The IT-system shall therefore be used to develop a meaning and context which within the decisions can be taken.

Lindvall (2013) argues that poor decisions are mainly caused by the decisions process itself and that it is a common human error to assume that there is no need for a structured decision making process. In addition, Davenport et al. (2001) argue that managers will be more effective if they become aware of what the decision making process looks like. Lindvall (2013) even state that the use of a more systematically defined decision process and statistical model would improve the decision making process. In ‘System 2’ the decision making is more structured and less influenced by individuals’ experiences and conceptions, and the decision making process and analysis would be more structured if a model is developed. Lindvall (2013) therefore concludes that statistical models to some extent would neutralize the decision making process.

4.4 Concluding Remarks

The research of Kahneman (2003), Lindvall (2013) and March (1987) emphasize the boundaries of human thinking as well as Simon’s (1997) concept of bounded rationality, and the shared conclusion is that humans are not rational. Lindvall (2013) is aware of the boundaries of the human mind but claims that a Business Intelligence system might neutralize the user. According to Lindvall (2013) this will result in a decision making process less influenced by human errors of thinking. Both Lindvall (2013) and March (1987) conclude that traditional theories of choice are insufficient and misleading when it comes to designing an IT system. Yet, March (1987) argues that it might be necessary to adjust the decision making process, and change how humans make decisions and interpret information. To some extent, both Lindvall (2013) and March (1987) strive towards a rational user but do simultaneously refer to the boundaries of the human mind.

Thomas H. Davenport, on the other hand, has a slightly different approach (consider for example Davenport 2006, Davenport & Harris, 2007 and Davenport et al., 2001). These frameworks consider data as rationality and the data are assumed to be neutral. The boundaries of human thinking are somewhat neglected and the user is expected to be rational and make rational decisions. Nevertheless, Davenport et al. (2001) likewise suggest that it might be necessary that the decision making process is reevaluated and adjusted.

The role of Business Intelligence as a decision support is central in the literature. The conceptions of decision making are therefore relevant to take into consideration since they will most likely influence the use of Business Intelligence systems as well.
5 Empirical Findings

This chapter is based on the interviews and the observation study. Yet, the empirical material will be simultaneously compared with the literature and alternate with my own analysis. This chapter is divided into three sections, and first comes the perspective of Corporation A, which is in the start-up phase with their Business Intelligence investment. The second part will be the outcome of the interviews with the IT-consultants and suppliers and the third section is based on the interviews with the users of Business Intelligence. Respondents to this last section are Corporation B, C and D. All interviews were held in Swedish and quotations have been translated to English.

5.1 The Need of Business Intelligence

The aim of including Corporation A in the study is to investigate why the company is investing in a Business Intelligence system and which problems the system is expected to solve. Relevant questions to consider are which information they expect the system to provide them with and how they expect the decision basis to be improved by a Business Intelligence system.

Current Management Accounting

There is currently no common ERP system within the group of companies. Some business areas aim to harmonize their systems and have one common system in the future, but the present situation is that the majority of subsidiaries have different systems.

Each month all subsidiaries report on their monthly financial statements in a standardized tool for consolidation to the head office. All subsidiaries report their own numbers but these numbers have also been consolidated and evaluated by the CFO of each business area. Controllers at the head office are analyses each business area and interview each CFO, which results in an internal management report.

The reporting standard within the business areas varies between the interviewed units, but both require reports on a weekly basis in addition to the monthly financial statement. In one unit the CFO and CEO have a weekly meeting with the local manager of the subsidiaries with focus on invoicing and orders. The current numbers are compared with a so-called flash and the budget. In connection to the monthly financial statement the CFO of this unit requires comments from the local manager and the manager of the subsidiary also provides a prediction (the flash) on turnover for the next month. In the other unit, all affiliated companies except two have the same ERP-system which makes it possible for the controller to compile weekly reports, so-called scorecards, without requiring additional information from the subsidiaries. However, the two entities with divergent systems are not included in the scorecards, and to be able to compile the monthly financial statements the respondent needs to require more information and comments from managers of the subsidiaries.

To absence of one common ERP system means much manual reporting and compilation in this organization, and a Business Intelligence system would most likely result in time sav-
ings. Some tendencies to encourage analytical thinking can be seen, for example when each manager is required to leave comments on their own numbers. One CFO also expresses that the standard of reporting is designed in a manner that shall make the subsidiaries more aware and analytical, with the aim to increase the analytical thinking within the organization.

**Problems with Current Management Reporting**

Both under the interviews and the observation study, the problem in focus are profitability and price. One aspect of the problem is that the products consist of a large number of components and add-ons, and it also becomes clear that some information is connected to orders and not to products. One controller expresses that “*It is impossible to determine if we charge a higher price for one product this year compared to last year, since exactly the same product did not exist last year.*” The preliminary calculation exists but is impossible to follow up through historical orders and invoices. During the interview the controller states that this is a problem since the organization is involved in heavy price negotiations and long-term contracts but is unable to ensure that the price adjustment become realized. The controller often receives questions concerning the margins, which products that are selling, how the price has developed and so on, but is unable to answer. The respondent can follow how the price has change in general but cannot explain *why* the price has changed.

The manual gathering and compilation of information is another problem. The accounting manager expresses that she sometimes avoid requiring information since she knows the effort to compile it. Since the respondent’s task is to compile numbers on group level, the numbers always has to be required from the business areas. If the respondent wants to compile something for analyses, it has to be done in Excel. Another respondent states that it is possible to answer all questions on margins and profitability but that it is time consuming when you have to gather information from several systems and persons as a complement to the database. One respondent working as an IT-specialist arguing that the ERP system collect enormous amount of data, but no one is able to retrieve data from the system. The respondent therefore spends a lot of time on compiling requested reports since people are unable to do it by themselves.

Another issue is that the quality of data is low and the respondents argue that this makes them distrust the system. One respondent states that this is due to the human error, articles might be missing in the system and is registered as another article or as a text position which the system is unable to interpret. When this ‘anonymous’ category consists of millions in sales, it becomes a problem according to one controller.

**Expectations of Business Intelligence**

To map the requirements and expectations on a Business Intelligence system, the hired consultants interviewed numerous people within the company and several of them were present during the workshop. The most commonly used words during these interviews were; ‘product’, ‘customer’, ‘information’ and ‘order’. The secondly most common words were; ‘analysis’, ‘cost’, ‘sales’ and ‘price’. The respondents want to know for example profit
per customer segment, profit per order, price in different countries and profitability and margin per product. One CFO requests statistics from all perspectives and dimensions and also the ability to do cross-dimensional analyses. Within the group of companies there is an entity that functioning as an internal supplier. The CFO of this entity requests group-wide prognoses since they sometimes have to deny external customers to keep production capacity available for internal customers.

It also becomes clear that the participants from the company require highly detailed information. They want to include a high number of attributes and levels in the system which is questioned by one of the consultant. “But even if you will have all this, will it makes you more competitive? If you know that x % of the sales of one product in a certain area are white, how are you going to use that information to support decisions?” is his question. One participant arguing that it is all about understanding your business and that they seek the ability to follow trends and patterns in the market.

The interviewed respondents argue that Business Intelligence in the long run will create benefits for the organization. One of the respondent expresses; “We will be a better company” and states that the company will be able to earn more money with Business Intelligence. The respondents mention margin, price, customers, products and sales as areas where the company will be able to perform better when they have the right information. It is already in the company’s strategy but harder to reach with current tools according to the respondent. One respondent expresses that there are high expectations within the organization, so high that it even might affect the project negatively. “…the organization today has a conceptualization of that everything, everything will solve out if we just have Business Intelligence, and that is not true”. Another respondent indicates that the project will not imply benefits for all entities; some part of the organization might even lose on this project. The questions that are unanswered today will be impossible to answer even if the system is in place according to the respondent. The respondent thinks that people have not realized which effort is required and that the project might be abandoned due to its complexity, but the respondent still considering Business Intelligence as crucial for the future of the company.

Some respondents also stress the impact of Business Intelligence as decision support and the risks with low data quality. One respondent expresses that with the current system he is aware that data contain errors, but with a Business Intelligence system he might be unable to determine if the information is correct or not. The user might then interpret incorrect information as true and take decisions based on that information.

During the observation study it becomes clear that some managers are very much ahead in their vision and what you can do with the Business Intelligence system. Some of the respondents also have a lot of valuable insights, for example the value of high data quality and that it requires a certain behavior from the organization. One respondent has even considered the connection between rationality and Business Intelligence, and concluded that it probably will make the organization more rational even if not to 100 %. This respondent values rationality and think that more rational decision makers will be beneficial for the corporation. However, during the interviews the picture turns out to be more nu-
anced and it becomes clear that the degree of ripeness of Business Intelligence is highly diversified within the organization.

The expectations of Business Intelligence are to a large extent in line with the benefits described in the literature. These words that were pictured as common used during the workshop, such as ‘product’, ‘customer’ and ‘sales’ are similarly common in the literature when it comes to describing the value of Business Intelligence.

5.2 The Perspective of IT-Consultants and Suppliers

This section is based on interviews with professionals within Business Intelligence. The picture emerging is to a large extent coherent and the respondents have similar experiences.

The Definition of Business Intelligence

The interviewed consultants mention a wide range of definitions on Business Intelligence. Common aspects are that Business Intelligence is about information, gathering information from several systems and structuring the information so it can be used for follow-up the performance of the organization.

“Give numbers and data a meaning and purpose and enable analyses…The Swedish translation is not bad, 'decision support system', it shall be a support for decision making.”

“To collect structured information, data, and harmonize it to comparability no matter how many sources the data come from, and make it accessible for a user through visualization. Make it easy to work with and understand the information. BI is for me a technical tool that solves a business problem.”

“A wide spectra of different things. But when it comes to the crunch, organizations want to operate in a better way and more effective way. For me, BI is to provide the decision makers with better basis for decisions so they can take better decisions…Give insight to ‘What are we doing, what have we done and what should we do?’”

"Decision support. Intrinsically to collect information from several sources to create a foundation for knowledge, insight. Be able to take better decision and be in control of the organization.”

The definitions above strongly emphasize the role of Business Intelligence as a system for decision support. Business Intelligence can provide decision makers with a better basis for decisions, provide knowledge and insight and make decision makers to make better and more informed decisions are some of the aspect that the respondents mention.

As can be seen, the definitions expressed by the respondents do not differ from the definitions in the literature, at least not to any larger extent. A large focus is in Business Intelligence as a decision support system but also as a system to extract, clean and compile data, which appears both in the definitions of the respondents as in the literature.

The Value of Business Intelligence

Most respondents highlight customers and suppliers as areas in which Business Intelligence can provide value, which is also in line with the literature. When the company can identify
their most profitable customers or products they can sell more and level their marketing to certain customers are the arguments from the respondents. One consultant gives an example of a company that made a so-called shopping basket analysis and identified which products their customers bought in combination with other products. This information was used to determine how the products shall be placed in relation to each other to increase sales. Another consultant gives the example of a telecom company who identified their most profitable customers and then tried to find ‘twins’ to these customers, with the aim of achieving a larger share of profitable customers.

The respondents consider information as crucial and it becomes very central during the interviews. One respondent argues for example that the value of Business Intelligence partially consists of that data is collected, aggregated and cleaned. Grouping data and creating metadata generates value according to one respondent, which indicates that the information itself is highly valued. However, one respondent states; "If you look at the information available in the system there is a huge amount of information about how good the products are, which customers like which products, which products are profitable and which are not, but that information is not used…they do not manage to collect it, harmonize it, set rules and create metadata…There is a huge amount of information that no one uses."

This statement confirms Davenport et al. (2010) argumentation of that organizations to some extent are unable to translate data into insight and knowledge.

**The Respondents’ View of the User**

When the respondents are asked to evaluate how their customers are using the system and if the customers are exploiting the full potential of the systems, one consultant answers: “Most often, yes.” Examples of other consultants’ answers are: “No”, “It is rare”, “Large variation”, “So-so”, “Depends on” and “Varies from customer to customer”. One consultant takes one example of a client where the employees open up the Business Intelligence system the first thing they do in the morning, if the system has not loaded new data they call the support immediately and wonder what is wrong. In other organizations the system might not have loaded new data in the last month when they call for support.

It is common that there are few interested individuals that have knowledge of the system but when they quit their job the knowledge they possess is not transferred to the next person because the knowledge is not documented or incorporated into routines. Most organizations seem to have failed with creating an analytical environment with focus on data, as suggested by Davenport et al. (2001), Lindvall (2013) and Eckerson (2003).

**What is Analysis?**

The respondents provide a quite homogeneous view of analytics and analysis and what it is. Most of the respondents refer to analysis as the analysis of sales, costs, revenues and margins, and also often describe it as to twist and turn data around and group it in different manners. The aim with this shall be to discover patterns and create new knowledge, as one respondent expresses: “The aim with analysis it to create new knowledge out of data…Data is the base, group and describe with metadata to create information and knowledge. Analytics is about creating
new knowledge out of information, consisting of data and descriptions of data.” However, Thomas Schiffer from Stratiteq, also argues that analytics is about abstract reasoning and that Business Intelligence is about the ability of consecution, and here many organizations fail. “The ability to fantasize or the ability to see possibilities can sometimes be an obstacle. Organizations are unable to fantasize about what they actual can do. And the cognitive map comes back, you are used to solve problems in the same way, for example if we shall increase the sales, I lower the price to increase the volume because that how I usually do.”

The argumentation of Schiffer might be related to how Zuboff (1985) describes the concept of inductive reasoning as the ability to see relationships between variables, and the use of data to test and build hypotheses. Instead of just following up in which direction things are moving, Schiffer argues that it is all about asking new questions or to use the words of Zuboff (1985) to create new hypothesis. ‘Would we be able to sell more if we sell another product?’, “Shall we target another customer segment?” and ‘What is required then?’ are examples of what according to Schiffer would be ‘new’ questions.

In the framework of Davenport & Harris (2007) and also Lindvall (2013) there is strong focus of analytics as statistical modeling. However, it turned out to be rare that organizations have internal analytical expertise such as statisticians and advanced statistical tools are not very frequently used. In the observed organizations, the analysis is carried out by controllers or middle-management. To perform analytics in the same manner as Davenport & Harris (2007) and Lindvall (2013) suggest seems to be exceptional. However, Jonas Gummesson from Sogeti argues that analytics will be a presumption for competitiveness in the future which is consistent with Davenport’s (2006) emphasis on analytics as a competitive advantage.

**The Analytical Capability of the User**

According to the respondents the analytical capability of the user depends on a number of factors. Previous experience, role and personality are factors mentioned by the respondents. One respondent brings up an example of controllers who are experienced users of Excel and for those the Business Intelligence system is more or less just an easier way to do what they already do. Several respondents stress that it is most often a smaller group of users who are analytical. “…then there is a smaller group within the company, that have its own ideas, want to be able to twist and turn the data, dig down deep in the data and understand correlations and so on. And they can be very analytical but it is most often a tiny, tiny number of people.” One respondent states that the relationship between the user who are analytics and those who are not is 1/10 or in some cases 1/20, and this is due to that many people do not understand the value of being analytical. “They just consume ready-made reports, they are not analytical, not used to do their own analysis… They have no need of twisting and turning the data…filter the data or group it in different manners.”

Several respondents state that all employees do not have to be analytical. You might not have the same need for analytics in all levels of the organization is one argument from the respondents. A controller has probably a higher need for analytics than a salesman. Another respondent argues that the highest management might be able to understand only the
consolidated data but if they need more detailed information they can delegate that task to someone who manages it. This perspective is somewhat an opposite of the literature where it is assumed that all users shall be analytical. In the framework of Davenport et al. (2001) there is for example a strong focus on the organization as a whole.

Change in Behavior

The respondents state that the use of Business Intelligence frequently affects the behavior of the organization. To start with, some respondents highlight a more clear communication as an effect of using Business Intelligence. “More clear talks, internally but also externally… I can go to a supplier without tremble of the cuff and say you do not keep up with our delivery agreements…you cost us money and I can base that on facts. You get an advantage in negotiations and self-confidence in your profession.” The internal communication also becomes more straightforward and the discussion more constructive according to the same respondent. Anders Hagberg from PdB, argues that the dialogue becomes more constructive when it is easier to follow-up and that the discussion concerning improvements and outcomes tends to be more constructive. The use of Business Intelligence does to some extent strengthen the relationship between cause and effect according to the respondent which is in line with Lindvall’s (2013) argumentation. Another respondent argues that; “If you do not have BI, you probably following up your business in a quite unstructured way.”

The Organization Becomes a Reflecting Organization

According to several respondents it is common that the customers do not know what they seek when contacting an IT-consultant. The aim with the project can be unclear and the clients do not know what they try to achieve, some of the consultants have received answers as “Everything!” and “Should not you know?” when they have asked “What do you want to measure?” Working with Business Intelligence can make the organization rethink why certain things are measured and revalue the need of measuring it. Gummesson explains: “…you have had reports for a long time but no real BI-project. When you starts with BI and we start to ask ‘what is it that you measuring’, ‘well, we measuring this’, ‘but why are you measuring this in this sense?’ and then they do not know, they do it because they did it last year. They do not understand their measurements, more than you use it as some kind of indicator of if something has decreased or increased since last year, but they have no idea of what they are measuring.” The respondent argues that the organization becomes a more reflecting organization when using Business Intelligence, in that sense that you reflect more on what is going on within the organization and which effect it has. One respondent expresses that things come up to the surface and people are forced to rethink when using Business Intelligence.

Organizations can also become more of learning organizations according to the respondents. “Becomes a learning organization…standing on the shoulders of the giants…You do not have to invent the wheel over and over again, see further and further each time.” Another respondent states that Business Intelligence makes organizations to evaluate their decisions and answer if the decision was right or wrong and why the decision was taken. If the decision turned out to be wrong, the organization might at least ensure that they have learned something according to the respondent. This reasoning is close to Eckerson’s (2003) model on p. 17 where the
actions and results constantly are evaluated and lead to intelligence. One respondent also stresses that; “Previously the gut feeling was used mostly because you had no other base for decisions…Might have been correct decision but impossible to explain why.” The Business Intelligence system can in this case provide an explanation according to the respondent.

**Business Intelligence as a Decision Support System**

When responding to the question of how Business Intelligence can provide value to an organization, most respondents mentioned that it will make organizations take more informed decisions.

“The decisions become more fact-based and the underlying discussion becomes more fact-based… If you do not have access to the information you cannot use it as basis for decision. If you make better or worse decision when you have access to information, I cannot answer. But I hope that they take better decisions when they have access to better information about the underlying cause. That is the reason why people invest in BI-system, I hope.”

“…provides well-adapted information to a decision maker. A support for those people who makes decisions. Better knowledge before they take the decision.”

However, Schiffer argues that it somewhat depends on which decision shall be made since different decisions do not require the same type of information. “Depends on where the question comes from. Most often it is structured decisions that shall be taken, if it is a more fuzzy decision it is much harder to work with structured data. We need a new logotype; shall it be yellow or blue? When you need information about feelings and perceptions you shall expect less help from a BI-system.” Schiffer argues that the level of how structured the problem is affects the usability of the system and that emotions are important but cannot be measured. An example of a structured decision would be if the corporation shall launch a new product on a new market and how many units they will be able to sell in that case. If the problem is less concrete it is hard to apply structured data, however it is not impossible according to Schiffer. This argumentation is in consistent with the framework of Davenport et al. (2001) and Turban et al. (2007), and will also be confirmed in the third section of this chapter.

One respondent stresses that the system can provide the decision maker with an infinite number of indicators pointing in different directions. When you go too much into details there is a risk that you lose the holistic approach and do not understand the relationship between the variables but act upon individual and sometimes false signals. “Business Intelligence can create nervousness and how to say, that you see ghosts.” However, Lindvall (2013) considers this a benefit when describing the predictive models in Business Intelligence. The quote from the respondent nevertheless indicates that it is not only beneficial for the user, one respondent also mentions that the user must be able to sort out which indicators and variables those are significant and of more or less importance.

Similarly, the example above can be connected to Zuboff’s (1985) emphasize of the ability to have a theoretical conception in mind. To be able to determine which variables are of importance the user must according to Zuboff (1986) have some frame of reference or theoretical conception to refer to.
A Distinct Management

The respondents consider that many organizations are struggling with poor management. This can be seen from two perspectives. First, several of the respondents stress that this is reflected in the initial phase of the project when the customer is asked to set requirements. ‘Where are you going’, ‘what do you want to achieve’ and why do you need to achieve that? are examples of questions that some customers are unable to answer according to the respondents. Many customers just consider what they are doing right now, not what they want to achieve. Second, this affects how you use your Business Intelligence system. As Daniel Strånge from Pdb expresses: “If there are clear goals of where you are going… then of course you need a way to measure it and this is the role of BI… we can see that those customers with a distinct management concerning budgeting and goal, it is more likely that the BI system is used and permeate the organization as a whole.” This is also confirmed by Davenport et al. (2001) who argue that a clear and detailed strategy is crucial when it comes to information management. Otherwise the employees will have difficulties to determine which data and information to focus on.

Similarly, Hagberg argues that unclear targets affect Business Intelligence in a negative manner and that it is common that there are organizations with no targets or unclear targets; if there are targets they might not be communicated or achievable. “A goal shall measurable and realistic, often this is considered as theoretical nonsense but there is definitely some truth here. There is no one who confesses themselves to or accepts the management model you adapting; targets are not communicated and not realistic. The strategy is not so clear and defined that the organization uses it and believes in it.” These experiences of the respondents can be related to March’s (1987) argumentation of how decisions are made into a context and with the aim to develop a meaning.

Business Intelligence and Intuition

Even if the common perspective among the respondents is that the role of intuition has decreased with Business Intelligence, the picture is still somewhat dispersed. One respondent states that “If you have access to more information and data, you can let it guide you, but I think it is also personal. Some people are emotional and will more often take emotional decisions.” Another respondent expresses that Business Intelligence has implied less acceptance for decision routinely made on past experience, you are expected to be able to prove your decision with data and/or some kind of analyses.

The respondents argue that it can be easier to make tougher decisions if you have facts that support those decisions. One respondent express that if the decision maker has a better basis for decision it is more likely that a logical decision will be taken. Most respondents see a connection between Business Intelligence and rationality in the way the system is built up, since it is argued that the system is built up from logic, statistics and predetermined processes.

The majority of respondents think that Business Intelligence shall be considered as a confirmation of intuition and more as complement to intuition than an opposite to it.
“Gut feeling shall probably still be used but incorporate a larger share of processed information…BI shall be a complement to intuition and gut feeling. Intuition is built up by previous experience and therefore useful in some situations and in combination with reflection…You should not put BI and intuition as opposites to each other.”

“Intuition will be based on all information you have access to. But the more information you have, the safer you can be with your decision.”

“…previously it was just gut feeling…but it is quite comfortable to get that feeling confirmed even if the gut feeling most often is right.”

“The BI system can answer what to do but not why, you need to make an own interpretation…The system will give suggestions out of statistics and data. It is crucial that the user makes an own translation and questioning if the system actually has included all variables of importance.”

Another argument for the use of intuition is that it can be a starting point for reflection. “The gut feeling if often the start for analysis. I have a feeling of something…I want to investigate something further since I have a feeling of something being wrong, then you get either a confirmation or denial of your gut feeling.” Another respondent fills in “Your gut feeling can still be a start for ideas and new ways of doing things…The gut feeling is ideas and inventions.” The feeling introduced by your intuition do still have to be rationalized somehow, you need to translate it into practice and therefore the respondent considering intuition as a starting point for reflection and analysis.

One respondent argues that a Business Intelligence system can be advanced to ‘take’ just as good decisions as experienced decision makers. Organizations that are very mature from a Business Intelligence perspective might partially automate certain decisions and connect the Business Intelligence system to the receiver of the decision for example another IT-system.

### 5.3 The Perspective of the Users

All of the respondents are highly involved in the Business Intelligence system and the development of it. One respondent is responsible for the system, another has been involved in several developing projects and others have been involved in the start-up project. The group of respondents is not a homogenous group; they work in varied areas and possess different positions which imply that they use the system in quite different ways as well.

#### The Usage of Business Intelligence

Several respondents stress the role of Business Intelligence as a foundation for discussion internally as well as externally. One respondent uses the system as a guideline for further action when it comes to suppliers, the company has several measurements on time of delivery which can be used in the negotiations with the supplier. If a supplier aims to increase its prices with e.g. 5% but have performed poorly when it comes to the lead time, the respondent claims that it easier to have a constructive and solution-oriented discussion. The respondent might for example suggest a three percentage increase to start with and if the supplier manages to fulfill the agreed terms of delivery, they will get the remaining two percentages as well. The respondent also argues that when you have a picture of the total pur-
chase from a certain supplier you get a hint of which prices you should be able to achieve through negotiation. The respondent states that if the total purchase has increased from 1 million to 7 million and then you would be able to receive better prices due to the increased volume in purchase.

Other respondents use the system as provider of prognoses of sales and thereby determine the production need. Several respondents also highlight product, margins and prices as areas where they have use of the system. Which products to keep and which to cut can be one example or which prices to charge when you have better control and insights in the margins. Those areas mentioned by the users of Business Intelligence are to a large extent consistent with the expectations from Corporation A and also with the literature.

**The Capability of the User**

The respondents consider themselves as frequent users but they do not think that the rest of the organization is using the system in the same manner. The respondents express that it requires much effort and time to make others understand the system. All of the respondents verify that it is a long takeoff from the organizational perspective. One respondent explains that previous knowledge and experience in Excel has turned out to be an advantage, those users have easier to understand the Business Intelligence system. Most often the outcome from the data warehouse needs to be ‘fixed’ in some sense to make it more understandable and easy to interpret for the receiver, and then the experience from Excel can facilitate this step. Another respondent highlights that the users’ previous experience in building and reading reports in general can have an impact on the usage of the system. That previous experience of Excel has a facilitating effect is mentioned by the IT-consultants as well, yet this experience is most often concentrated to single individuals.

In some corporations there is also still a very widespread use of Excel, even if they have a Business Intelligence system. It can for example be that one department still uses only Excel, or that employees report data in Excel when additional numbers are needed.

All of the respondents argue that they understand the system, but that the rest of the organization most often does not. The respondents express that it is common that people do not understand which field in the system that provides which information, and how the data are built up from underlying systems. One division has solved this by incorporating additional explanations into the system, so the users easily can see which field contains which information and which period it refers to. The respondent states that the more comfortable people are with the system, the more secure they will feel with the reports and the more secure with taking decisions based on information provided in the reports. The more they use the system, the better they get in translating the numbers and data as well according to the respondent.

This also implies that comparable numbers are hard to achieve, one respondent states that people still show up at meetings with different numbers of the same measurement. This is, according to the respondent, due to that the users do not understand the variables when building the reports and therefore accidently choose variables that are similar to each other,
but not the exact same. The numbers of ‘Weekly sales’ will differ depending on which variables you include and how you build the report, and that numbers are not comparable happens now and then according to the respondent.

Another respondent argues that it is all about understanding the underlying process, if people do not understand it they will be unable to interpret and translate data retrieved from that process. “This is where many fail, they do not really get how we operate, they do not understand what the process looks like… When you ask questions and do not understand the process, how the flow of products goes and how costs are built up, if you do not understand that you cannot translate the data correct”. This can be connected to Zuboff’s (1985) framework of abstract reasoning. Zuboff (1985) argues that a computerized environment implies more abstract elements and requires that the user is able to relate data to the physical activities and processes. The respondent in this case has probably a more practical approach and refers to that people do not understand the core activities and processes. Yet, it can be argued that there is a connection to Zuboff (1985) since the respondent indicates that the users are unable to interpret data retrieved from the processes.

**Business Intelligence and Decisions**

All respondents argue that they make better decisions with the Business Intelligence system compared to before. The argument is that the decisions have become more informed when you have more information, more data and more correct data. One respondents states that there is varies ways and possibilities to find information, both on high and detailed level, which according to the respondent implies better decisions. Another respondent expresses that the system is a foundation for strategic decisions in his division; “From the perspective of the business, I will not say that it is crucial, like completely determinant, but it is an important part of our price negotiations” and the respondents further on argues that the Business Intelligence system and the reports it is providing are a “business foundation”.

In general the respondents state that they feel more secure and safe with their decisions. “I feel much safer with what I am doing. Because you know that it is not just a feeling that I have, but this is facts, this is how it is, this is correct… So yes, absolutely, this helps us a lot in our decision making.” Another respondent compares the previous decision support with current decision support and express; “More feeling. Now you can refute information, there is data actual showing how it is. It is not just a feeling or conclusion. If this and this and that pointing in one direction, it should be like that but now you actual can verify it as well…This data was not available before.”

The awareness of that the competitors also work with Business Intelligence makes one respondent to compare with the sport worlds; “We have competitors, we are competing with them in the same manner as any athlete. The better tool we have the better chance to win, eh? … If you are about to being on track and fight towards the greatest, you will need to have the greatest tools… We might not achieve a better result compare to before but we would have achieved a lower result if BI would not have been a part of the picture.”

The respondents claim that their organization has a better target achievement and that the targets have become clearer. For example one respondent argues that overall and general
targets are easier to break down into smaller and step-by-step goal and that it is easier to see what your own division can do to reach the overall goals. The respondent takes an example of the goal of 95% timely deliveries; “It can be hard for us in operative level to work with. When it is so overall, but then we can use BI to go to a lower level and see how much is 95% of my subgroups, my models, my storages? ...General goals are not easy to transform into personal goals, but since you can go down to details it is easier to get a concrete goal.” This aspect can be connected to the improvement in the internal communication as one of the IT-consultants mentioned in previous section. It was argued that it is easier to follow up internal goals when using Business Intelligence.

One respondent expresses that some decisions are harder to take with the help from the system, for example if going into a new market and setting price in new markets. The organization then applies previous experience or compares with similar countries. That structured decisions are easier to take with help from IT-systems has been suggested by Turban et al. (2007) and Davenport et al. (2001), and has also been indicated in the interviews with IT-consultants. Yet, the respondent in the case do not refer to structured and unstructured decisions, but the described problem would match a unstructured problem described in the literature.

According to the respondents it happens now and then that the core data turns out to be incorrect or misleading. One respondent highlights that this may cause irritation and can create distrust towards the numbers and the system. The same respondent also expresses that it can be frustrating to be aware of that some KPIs contain errors and in the same time be aware of that the management evaluate their division based on these KPIs. The operative management knows that some measurements are built up by false data but when the higher management only considering aggregated and compiled numbers there is a risk that the decision support also is false and misleading. The respondent stresses that this can imply that the organization takes less appropriate decisions if the higher management not become aware of which KPIs that might be misleading. This aspect is of concern in Corporation A as well, since they fear that the decision base will be misleading without anyone noticing and the danger with low data quality is also mentioned by the IT-consultants.

**How Decision Support Has Improved**

Several of the respondents argue that the decision support has improved since it is much more extensive now, the respondents state that they have access to more information with the Business Intelligence system. The respondents claim they take better decisions since they are more informed, more information results in more informed decisions and there through better decisions is the argument.

One respondent argues the Business Intelligence system makes it easier to respond faster to certain events and takes the example of monthly sales. When three weeks have passed the sales should be ¾ of planned/budgeted sales for that month and if not, they can react directly instead of following it up at the end of the month. Another respondent argues that there is a value in the ability to measure variables more often and build trends since he considering trends to be important, a Business Intelligence system can to a larger extent allow
this kind of measuring compared to other system. The respondents also mentioning that the Business Intelligence system is better in producing reports and have improved the possibilities for analyses, especially when the data is compiled and aggregated, for example on a world-wide level instead of on national level.

There are examples of situations when the system makes decision. In one organization the suggestions by Eckerson (2003) is reality, and the users have created certain rules to make the system to take decisions. In this corporation the Business Intelligence system is used for inter alia prognoses, the system calculates a production need out of the current stock status together with the calculated prognoses and transfer it to the production system.

**Business Intelligence and Intuition**

Most respondents consider data as a support to intuition, they state that intuition still is important but that intuition and gut feeling are built on data. One respondent expresses: "The gut feeling is built up from a number of impressions during a longer period of time and learned something. You get these impressions and it is happening on these things and in this manner. A feeling for how to interpret the numbers and a gut feeling based on input. The more input you get from the Business Intelligence system, the better gut feeling you get".

However, one respondent emphasizes that it is important to know your business and your organization as well. Another respondent working with suppliers highlights that you most often get a feeling of the supplier; "To some extent it is gut feeling. You get a feeling when visiting the company, you believe in them, see a potential. Even if the statistics sometimes can be poor you can still have a feeling for that it is a good cooperation, I do not think that this is unimportant, absolutely not." Nevertheless, the respondent still argues that it feels comfortable to have the statistics as a foundation. The respondent, who is working with procurement, claim that he most often has a feeling for the outcome since he is aware of which negotiations they have been involved in and what the effect should be. This can be considered as an example of how intuition and data can co-exist, the respondent has a gut feeling for the outcome but use the system to confirm and follow-up the expectations.

According to the respondents data can make you reconsider your gut feeling and expectations, one respondent takes the example of which the most profitable product is and that you might be forced to rethink if the data is not confirming your expectation. If this turns out to be the case, the respondent states that he do further investigations, for example to control what the product calculation look like to see if the price setting might be incorrect. Another respondent also brings up the situation when intuition and data are not consistent with each other, states that you most often expect them to be consistent but if not he solves the situation by digging further and investigate more.
6 Summarizing Analysis

A first summarizing aspect is that the use of Business Intelligence is highly diversified, both within organizations but also between organizations. In some of the respondents’ corporations, Excel is still widely used as a compiling tool and some departments do not even use the Business Intelligence system. All of the interviewed users are involved or have been involved in the Business Intelligence project. This probably implies that these respondents are more familiar with the system and therefore are extensive users. However, the respondents think that the rest of the company does not use the system to the same extent as they do. The perspective of the IT-consultants and suppliers to a large extent confirm this picture of the use and maturity of Business Intelligence as varying.

This diversified experience and use within organizations might be explained by the difficulties with creating a management and environment with focus on data and analytics as described in the literature (see for example Davenport et al. (2001), Lindvall (2013) and Eckerson (2003)). Respondents argue that it is common with a small share of advanced users and also that the knowledge of the system is often limited to single individuals within the organization. If these individuals will quit their employment, the knowledge and experience will get lost since it is not turned into routines and shared knowledge. In the light of the framework of Davenport et al. (2001), it seems like many organizations fail with creating a data-oriented environment.

6.1 Analytical Thinking

The analytical thinking as described by Davenport & Harris (2007), turned out to be rare among the users in this study. Davenport & Harris (2007) describe analytics as the use of data to construct statistical and predictive models such as algorithms, and have in general an extensive focus on analytical expertise and statistics. Lindvall (2013) also stresses the use of statistical models as part of analytical thinking. However, most of respondents do not apply statistical or qualitative models, and it is also uncommon with predictive and/or simulation models. None of the organizations in this study have analytical experts or statisticians employed.

With this said, it is not argued that analysis is absent in these corporations. Analyses are frequently made, but probably not as described in the literature. The word analytics is for example not so frequently used in the interviews with the users as in the literature concerning Business Intelligence. The users do not refer to their daily activities as analysis or analytics, yet during the interviews it becomes clear that all of them interpret and consider an infinite amount of numbers, data and information during one single working day. The IT-consultants, on the other hand, talk more about analysis. The aim with analysis is according to these respondents to create new knowledge but how this shall be done is more unclear. ‘Analyses’ seems to be an abstract activity which becomes complicated if organizations shall follow Lindvall’s (2013) recommendation to in advance design a management with focus on analytics.
How data in reality becomes knowledge and intelligence seems to be closer to Zuboff’s (1985) and Eckerson’s (2003) argumentation than to Davenport & Harris’ (2007) and Lindvall’s (2013). Eckerson’s (2003) model on p. 17 does for example illustrate how information and achieved knowledge build plans and actions. These actions will be evaluated such as described by one respondent when organizations evaluate why certain decision were taken and if it was the right decision. This is probably closer to how organizations in reality will become more intelligent when using Business Intelligence. In addition one of the respondents connects analytical thinking to abstract reasoning, as Zuboff (1985) does.

6.2 Organizations as Chaotic

Several of the IT-consultants reckon that it is common with organizations without clear targets. One respondent illustrates cases where no one within the organization take responsibility for the management model and that goals are not established and well communicated. The respondents argue that this becomes clear also during that start-up phase when the customers are asked to explain what they want to measure and why. Most customers do not know what they want to achieve with their Business Intelligence system.

This can be connected to March’s (1987) argumentation of organizations as chaotic and loosely coupled systems. March argues that there seems to be no connection between the problem and actions taken within the organization and that the relationship between cause and effect is weak. The use of a Business Intelligence system can according to several respondents strengthen this relationship. Several IT-consultants stress that a clear problem formulation is necessary when starting up a Business Intelligence project, yet many customers are unable to phrase one. The respondents stress that Business Intelligence force organizations to rethink and become more reflecting which also might lead to that the connection between problem and solution is strengthen. The users express that it is easier to identify which actions their own department and they as individuals can take to fulfill the targets and the IT-consultants express that organizations tend to be more clear and straightforward in monitoring their operations when using Business Intelligence, the relationship between cause and effect can there through be strengthened.

It might also be relevant to refer to March’s (1987) research that decisions are taken in a context, but also to create a context and to develop meaning. In this case, a strategy and expressed core values can be said to compose the context and/or meaning. If decision makers experience a strong context and meaning within their organization, in other words if the organization has a clear strategy and shared values, it is reasonable to argue that decisions taken would be more in line with that organizations strategy as well. If the targets are unclear, employees do not have any context to contribute to. This might explain why Business Intelligence is more extensively used in organizations with a clear strategy. This can also be connected to Lindvall (2013) who argues that Business Intelligence has a role as a sense maker.
6.3 The Value of Information

What really becomes central in the empirical part of this study is information. To start with, one of the IT-consultants states that the value of Business Intelligence is to add metadata to aggregated and cleaned data, which would be similar to Eckerson’s (2003) description of Business Intelligence as a data refinery. The value is somehow within the refined data and within the retrieved information itself. This is also visible in the arguments from Corporation A, which requests more information and more detailed information. Among the users it is also common to request more information and more detailed information.

Nevertheless, there exists a paradox here. Several respondents ask for more information while the IT-consultants argue that there is a lot of information accessible and also a large potential in the existing information. It would be reasonable to argue that this confirms Davenport et al. (2001) statement that organizations are partially unable to create value out of data and information.

6.4 Decision Making

A shared assumption among the respondents seems to be that if you know something, you will be better off, just by knowing. There is an extensive focus on information, which on the other hand can be connected to Davenport & Harris’ (2007) statement about analytics and that it is better to know something than to feel or believe something. This is also shared among the respondents when it comes to intuition, the argument is that it feels comfortable to get your intuition confirmed. Among the respondents there also seems to be an assumption that if you have enough information you will make the right decision. The argument is that the more data and information you have, the better the decision will be. This as well confirms Lindvall’s (2013) argument that it is common that organizations assume that there is no need for a structured decision making process. It is somehow assumed that it will solve out by itself.

Several respondents have had problems talking about their own decision making process, it just something that you ‘do’ and the respondents appear to some extent be unaware of how they make decisions. One explanation could be that the respondents are so used to making decisions that they do not even consider certain decisions as decisions. For example several respondents had difficulties to describe their decision making process and which information they consider in decisions. In addition, the respondents do no separation between their own intuition and facts from the beginning of the interview. When the questions concerning intuition comes up, it becomes clear that most respondents are not used to considering intuition as something separated from the decision making; it is a part of it. Some respondents have asked me to explain the question further or to repeat it and several respondents, from all categories, have become more reticent when talking about intuition and gut feeling and what impact it really has on decisions.

This is probably not so strange since intuition by nature is something intuitively and highly abstract, however this becomes a problem if organizations shall follow Davenport et al. (2001) and Lindvall’s (2013) suggestion and make managers more aware of what their deci-
sion making process really looks like. The literature emphasizes the decision making process and how it can be less affected by the user, a first step would according to Davenport et al (2001) be to make the decision maker aware of what the process in fact looks like. However, it would be reasonable to argue that this probably will be complicated, since the respondents to a large extent appear to be quite unconscious of their own decision making process.

A clearer decision making process would according to Lindvall (2013) imply better and more neutral decisions. To some extent, it can be argued that Business Intelligence has contributed to this. Several respondents do still consider intuition as something important and useful but numerous respondents stress that the Business Intelligence system can confirm your gut feeling. The system is in many cases used to confirm your feeling. This might be connected to Kahneman’s (2003) framework of ‘System 1’ and ‘System 2’, where the intuition would correspond to ‘System 1’ and in this case data to ‘System 2’. When the users seek confirmation from the IT-system, this can be considered a more reflective activity if the users for example search for an explanation for last week’s high procurement costs. One respondent states that when considering data the gut feeling sometimes turns out to be false which can be connected to Kahneman’s (2003) suggestion of that ‘System 2’ has the ability to correct errors. However, it is then crucial that the user does not suppress alternatives explanations or just seek information to confirm the first perception as described by Lindvall (2013).
7 Conclusion

In this section some final conclusions will be presented, and intend to answer the research question defined in the introductory chapter;

*To what extent are Business Intelligence systems used to support decisions in organizations?*

- **The system is mostly used as a provider of information.**

  The users retrieve information concerning for example suppliers, value/number of units bought from each supplier, margins vs. actual price and prognoses. The major use consists of producing reports. The use of Business Intelligence implies that more information is accessible. The organizations nowadays have information that previously was impossible to retrieve and the major benefit is more detailed information and the ability to drill-down.

- **The information itself is highly valued.**

  Business Intelligence creates value by adding value to data. This occurs when the data is aggregated, washed and made accessible for the user. Business Intelligence is considered as a provider of information and there through as a decision support. It is an assumption that if the user has enough information, the right decision will be made.

- **Intuition is still important.**

  Intuition and gut feeling are never isolated from the decision making process, the users do not differentiates between their own intuition and fact based information. The system is used to confirm the gut feeling.

- **The system can to some extent neutralize the decision making process.**

  Since the Business intelligence system is used to confirm intuition it can correct misconceptions, if the user accepts the explanation provided by the system.

- **The use of Business Intelligence might improve the target achievement.**

  Organizations can monitor their operations in a better way when using Business Intelligence. The internal communication becomes more fact based and objective. General targets are easier to separate into step-by-step targets when using a Business Intelligence system.

- **There is one example of when the system ‘makes’ decisions.**

  The decision is then subsequently controlled by humans.
8 Discussion

The use of Business Intelligence is highly diversified, both between organizations but also within organizations. Single individuals are competent users who understand the system, but express the rest of the organization is not on the same level of knowledge. If the user do not understands the system and which variables that measure what, they will not be able to interpret the information given. The report will most likely contain errors and present something else than the user intended, and therefore be misleading. This should be crucial for the use of Business Intelligence as decision support, since it implies that the system provides a misleading decision support.

One statement that occurred in the research process is that the users do not need to possess advanced statistical and analytical skills since these models shall be incorporated in the system. Yet, this implies that the user consumes a report without being aware of the underlying assumptions. It would be reasonable to argue that the more assumptions the report is based on, the higher the margin of error. Again, it is central to make the user more aware of how they system really functions and increase the users understandability.

Another aspect is how organizations view their decision makers. It seems to be that managerial decision still is considered as something that just ‘is’ and that there are no need for further investigation into this. Decision makers do not differ between intuition and fact based information, and are to some extent unaware of their own decision making process. How the respondents refer to their own decisions indicates that they are quite unaccustomed to evaluate their own decisions. Those theoretical conceptions of how humans will make better decisions conclude that new decision making processes must be designed and the literature present several suggestions of how the decision making process can be neutralized. However, when considering the empirical findings of how the users interpret information and make decisions, it becomes clear that Business Intelligence systems most likely never will ‘neutralize’ the user and decision maker.

Managers are to some extent unconscious of their own decision making process and which decisions are made. This can be argued to challenges the whole concept of ‘decision support system’. How can decision be supported if it is not noticed when they are made? Similarly, this questions the theoretical conceptions of the decision making process and how it can be neutralized, because they assume that the decision maker is aware of when decisions are made.

8.1 Future Research

During this study is has by some respondents been indicated that the use of Business Intelligence and in particular the analytical thinking differs between countries and that the use in for example the US is much more developed that in Sweden. However, other respondents have opposed this and argued that it differs from organization to organization. This opposition might be a starting point for future studies.
List of references


List of references


Appendix

Appendix 1: Interview guide – Future users

The respondent's background
- Position
- Tasks
- Experience in the business/time of employment in the company

Management accounting

Current reporting
- Which reports are you creating?
  a) Who is the receiver?
  b) What is the aim with the reports?
  c) Is there a standardized way of reporting? How often do you compile the reports?
  d) How are the reports distributed?
  e) How are the reports stored?
  f) For how long are the reports stored?
- Is there any information that you aim to include in the report, but are unable to do?
- Does it occur requests of information that cannot be met? From whom?
- Can it be situations when the system is insufficient or provide an insufficient amount of information?
- Which reports do you compile mostly for your own sake?

Problems with current reporting
- In brief, which problems occur in the current way of reporting?
- Does it within your organization exist inconsequent data that creating problems? Data that are obviously wrong etc.
- Can it be situations when the system is insufficient or provide an insufficient amount of information?
- How do you solve that kind of situation?
- Is there a standardized way of handling these kinds of situations?

Concluding question
- Do you have additional thoughts concerning how the reporting can be improved?

Analysis and decisions
- Why are the different reports needed? How do you use them?
- From your perspective, is there presumption for analytical thinking within the organization?
  a) Why/why not?
- Which kind of decisions are you most often involved in?
Appendix

- Which kind of information is most often used as decision basis? Ask for example! Last decision?
- Which information does you considering as relevant in decision making? Which information do you have access to and which information are you missing?

**Business Intelligence**

- How do you define Business Intelligence?
- What are your expectations on a Business Intelligence system?
  a) Which advantages do you think it will result in?
  b) Which disadvantages?
- Why does your organization invest in a Business Intelligence system?
- Who will be the primary user of the system?
- How will your role be affected?
  a) Routines
  b) Tasks
  c) Production of reports
  d) Processes
- How do you expect the system to be received?
  a) On a organizational level?
  b) In your division?
- Which problems do you expect to arise when the system is implemented?
- What do you think that Business Intelligence would imply for your organization in the long run? Improved financial result? Better decisions? Decreased costs?

**Concluding question**

- Is there any concluding remarks or clarification you want to bring up?
Appendix

Appendix 2: Interview guide – IT-consultants and suppliers

The respondent’s background
- Position
- Tasks
- Experience in the business/time of employment in the company

General questions concerning Business Intelligence

- How do you define Business Intelligence?
- Who is the primary customer of Business Intelligence?
- Who is the primary user? In which level?
- In which sense can Business Intelligence create value in an organization?
- Which problems is the system about to solve?
- How does the system affect an organizations process?
- Business Intelligence is usually considered as a system for decision support, in what sense can the system function as a support for decisions?
  a) Which type of decision does the system levels towards?
- How is the implementation followed up from your perspective?
  a) When is the project considered as finished?
  b) Is the follow-up a part of the negotiation?
- Which persons do you aim to involve in the project? (In the customers organization)
- Are there any mistakes that can be considered as general when it comes to the implementation of a Business Intelligence system? Ask for example!
- Is there anything that can be considered as a prerequisite for a successful implementation? Ask for example!
- From your perspective, are Business Intelligence users good in analytical thinking?
  a) Are there areas where analytical thinking is more frequent?
  b) How can decision makers improve their analytical thinking?

Organizations’ use of Business Intelligence

- Do organizations manage to exploit the full potential of the system? If yes, what does it imply? If no, what is missing?
- Do you considering organizations as good or poor in exploiting the information/data accessible in the system? Ask for examples!
- Do organizations understand their data?
- If the Business Intelligence does not manage to generate value to an organization, what can be possible reasons?
- When implementing a Business Intelligence system, which is the single major reform that an organization need to impose?
- It is necessary that the individual user adapt its behavior when working with Business Intelligence?
Appendix

- Would you argue that the organization’s behavior is affected or changing when Business Intelligence is used? If yes, how?
- Would you argue that the decision making process is affected?
- Can you see a connection between rationality and Business Intelligence system?

Concluding question

- Is there any concluding remarks and clarifications you would like to bring up?
Appendix

Appendix 3: Interview guide – The users

The respondent’s background
- Position
- Tasks
- Experience in the business/time of employment in the company

Management accounting

- Which reports are you creating?
  g) Who is the receiver?
  h) What is the aim with the reports?
  i) Is there a standardized way of reporting? How often do you compile the reports?
  j) How are the reports distributed?
  k) How are the reports stored?
  l) For how long are the reports stored? Do you ever check them twice?
- Is there any information that you aim to include in the report, but are unable to do?
- Does it occur requests of information that cannot be met? From whom?
- Can it be situations when the system is insufficient or provide an insufficient amount of information?
- How do you solve that kind of situation?
- Is there a standardized way of handling these kinds of situations?

Business Intelligence

- How do you define Business Intelligence?
- For which reasons did your organization invest in a Business Intelligence system? When was the system implemented?
- In which areas/divisions is the system used?
- Which reforms has the system implied? Positive/negative? Ask for example!
- Does Business Intelligence generate value to your organization? How? Small-middle-large value? What is beneficial/less beneficial?
- Can you mention any concrete benefit with the system? Concrete disadvantages?
- Do you consider the system as user-friendly? Do you understand the system and how it works?
- How do you considering the data quality? Do you put trust in the data? If the answer is no, ask for examples!

Decision support

- For which kind of decisions are you using the system?
- Do you have any perception of how other decision makers within your organization are incorporating the system?
- How was the decision basis before the implementation of the system?
Appendix

- Has the decision basis been improved? How?
- Consider the decision making process, which information is relevant to take into account according to you? How do you considering intuition and gut feeling?
- The decision support provided by the system, do you considering it as
  a) Relevant?
  b) Up-to-date?
  c) Enough?
- To which extent is the decisions based on decision support provided by the system?
- How frequently are you using the system? Do you open it every day?
- Are there any kinds of decisions where the system is harder to incorporate? Not provide relevant information etc.
- Would you argue that your organization is taking better decision now than before the implementation? Can the decision support be improved? Ask for examples!
- Would you argue that your organization has a better target achievement now than before the implementation? More concious and clear management? Ask for examples!
- From your perspective, does your organization exploit the full potential of the system?
- Are there any plans on further investments in Business Intelligence? What do you aim to achieve with those investments?