One Step Towards Creating Value From Big Data

- A case study on E.ON Elnät

Kajsa Andersson
John Elf

Technology Management

2015

Department of Business Administration
Lund School of Economics and Management, Lund University

Department of Packaging Logistics, Design Sciences Faculty of Engineering, Lund University

One Step Towards Creating Value From Big Data
- A Case Study on E.ON Elnät

Department of Packaging Logistics, Design Sciences
Faculty of Engineering, Lund University
Box 118
SE-221 00 Lund
Sweden

Department of Business Administration
Lund School of Economics and Management, Lund University
Box 7080
SE-220 07 Lund
Sweden

Master thesis, Technology Management – Nr 294/2015
ISSN 1651-0100
ISRN LUTVDG/TVTM--15/5294--/SE

E-huset Tryckeri 2015
Printed in Sweden

Abstract

Title: One Step Towards Creating Value From Big Data - A Case Study on E.ON Elnät

Authors: Kajsa Andersson - Master of Science in Business Administration and Technology Management

John Elf - Master of Science in Engineering Physics and Technology Management

Mentors: Stein Kleppestø - PhD and Assistant professor, Department of Business Administration, Lund School of Economics and Management

Malin Olander Roese - Assistant professor, Department of Packaging Logistics, Lund Institute of Technology

John Backe, Business Developer, E.ON Elnät Sverige AB

Issue of Study: Big Data is a relatively unexplored field and organizations are realizing the need to include it in their businesses. However, many ask themselves if Big Data can create any actual value? And if yes, how? Organizations are uncertain on the prerequisites in order to carry out a successful Big Data implementation. They have also shown hesitancy towards dealing with the ethical dilemmas of collecting personal data. E.ON Elnät approached us with similar questions asking what their next step should be regarding their Big Data initiative.

Purpose: The purpose of this study is to explore the first steps organizations can take in creating value from Big Data.

Method: This study has been conducted in a qualitative way with an inductive approach. Interviews were held with Big Data experts and organizations working with Big Data. The empirical findings were set against academic findings regarding strategy, organizational change and organizations' ethical dilemmas regarding customer data. E.ON Elnät is used to exemplify some of the questions and dilemmas that organizations entering the world of Big Data might have.

Conclusion: Entering a Big Data implementation phase can be viewed as an organizational change, where top management support, cross-functional teams and the supply of competence are essential in order for the implementation to become successful. To create value, these have been defined as prerequisites for a Big Data solution. Moreover, the handling of Big Data can be looked upon from two different perspectives; either internal, focusing on process efficiency or external, focusing on customer knowledge. Finally, organizations should develop an ethics strategy regarding the use of Big Data in order for customers and employees to feel secure in sharing and handling the personal data. In conclusion, Process Analytics, Customer Analytics and an ethics strategy are value creators within the field of Big Data Analytics.

Key words: Big Data, Process Analytics, Customer Analytics, Organizational Structure, Ethics.

Acknowledgement

Writing this master thesis has truly been an interesting and educative journey. The leap between academic studies and the "real world" has sometimes felt big and challenging. We believe that by writing this master thesis, the gap has shrunken. We therefore want to thank the entire E.ON Group, and especially E.ON Elnät for introducing us to this topic. In particular, we would like to thank John Backe, our mentor within E.ON Elnät for the time you have given us and the concern you have shown us. Without you, we would not have learned as much. We would also like to give warming thanks to all the employees within E.ON Elnät who have taken their time for our interviews and have let us observe them during meetings.

Further, we would like to acknowledge our academic mentors Malin Olander Roese and Stein Kleppestø. You have helped us during the whole process, guided us on to the right path and pushed us to arrive where we are today. For this, we sincerely thank you. Our only regret is that we could not spend more time with you.

Of course, we would also like to send a special thanks to Elin Skoghagen, Filip Eliasson and Britta Ek Thomas, our opponents, for taking your time and energy to help us reach a higher result. Sometime, we hope to repay you.

This master thesis marks the end of a long journey for the both of us. Our time at Lund University has been appreciated, fun and full of adventures. We would like to thank the whole university and all student unions that we have been a part of, and at the same time apologize - we made a mess. At least we know we will be remembered.

Lund, May 2015

John and Kajsa

Table of Content

Abbreviations and frequently used terms

Artificial Intelligence (AI) – The creation of machines or software with an intelligent behavior, i.e. machine learning

Business Intelligence (BI) – The process of turning raw data into meaningful insights in order to improve strategic decision-making in business

CKM – Customer Knowledge Management, is the process of collecting and making use of knowledge from, for and about customers

CRM – Customer Relationship Management, is the collection of tools and techniques used to record and handle interactions with existing and potential customers

Customer Analytics - Refers to the analyses of external processes, for example how customer knowledge can be increased

Feeder – The physical cable or line used to connect and transmit electricity between producers and consumers

MNO – Mobile Network Operator

Overhead conductor – Also known as overhead power line. It is the type of feeder that is above ground and attached to a tower or pole

Process Analytics - Refers to the analyses of internal processes and how processes can be made more efficient

1 Introduction

This chapter aims to introduce the reader to the field of Big Data by explaining how it derives from Artificial Intelligence and Business Intelligence. It also describes the origin of the idea to the study. Further, the chapter presents the research question, the purpose and delimitations of the study.

Arthur Samuel was a computer scientist who liked to play chess. In the mid 1990's, he programmed a computer to play against him by teaching the computer the basic rules of the game. He played and won, over and over again. Because Samuel had something the computer program did not: a strategy. He added a few mechanisms to the program in which it remembered every position it had ever seen. This data was used to statistically estimate the probability of any given board being a winning or a losing one. Samuel then left the computer playing itself, by which it collected data. When Samuel came back to play, he lost. Arthur Samuel had lost to a computer in a game that he had taught it. (McCarthy and Feigenbaum, 1990).

Arthur Samuel was a pioneer within the field of machine learning and Artificial Intelligence (AI). With AI, computers are no longer limited to what we tell them to do. A hypothesis called *The Technological Singularity* describes how technological breakthroughs will create an AI that exceeds human intellect, capacity and control (Muehlhauser, 2013). The Technological Singularity is a point in time described as an intelligence explosion, a time when super-intelligent machines create even more intelligent machines, machines whose design goes beyond what any human can imagine. Therefore, the machine that takes us through the Technological Singularity would be the last one the humankind will ever have to create.

Some argue that the Technological Singularity will occur in 2030, others say 2045. Even though no one knows when or if it will ever take place, we can see how AI and machine learning is being used in several fields today to help us see patterns that we are not capable of and make better decisions. One such field is Business Intelligence, where somewhat of a paradigm shift is taking place. Business Intelligence (BI) is the process of turning raw data into meaningful insights in order to improve strategic decision-making in business (Parr Rud, 2009). Traditionally, data analytics has been limited to internal and structured data, e.g. data collected only from within the organization itself and usually data found in an excel sheet. Today, analytical tools make it possible to analyze huge streams of external and unstructured data in a way that has not been possible before, e.g. data found external of the organization, often in the form of text, video, sound or picture (Parr Rud, 2009). One of the big differences is that rather than designing the analysis model to answer thought-out

questions, we rather just throw data at the model and let it find answers by itself, answers to questions that we never knew we should ask. This is what Thomas Davenport calls Analytics 3.0, which is used on huge and complex data streams to explain patterns in the past (descriptive), to predict the future (predictive) and to deliver the most optimized decisions (prescriptive) (Davenport and Dyché, 2013). These complex data streams and the analysis models to tackle them are more commonly known as the field of Big Data [1](see Figure 1). The era of Big Data brings radical changes to the way we use AI in decision-making in business and it is taking us one step closer to the Technological Singularity.

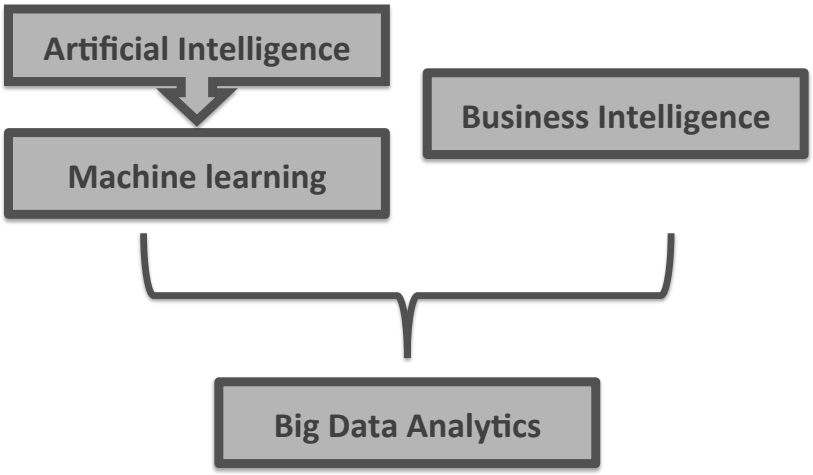


Figure 1 *The field of Artificial Intelligence and machine learning merges with Business Intelligence and creates Big Data Analytics*

1.1 Background

In our modern and digital society you create data in almost everything you do; when you use your phone, you produce location data, traffic data and so on. When you use your credit card, you produce data regarding your shopping behavior. With the era of digitalization, there has been an explosion of data. "*From the beginning of recorded time until 2003, we created 5 billion gigabytes of data. In 2011, the same amount of data was created nearly every two days. In 2013, the same amount of data was created every 10 minutes*" (Liu, 2014). So why is data so interesting? Well, through data analysis, data can be converted into information, which can be used to gain knowledge. With more knowledge you can get new insights, which in turn can be used to make better decisions. This process is the foundation in the world of BI.

[1] We have chosen to write Big Data with capital letters in order to emphasize that we refer to the phenomenon of Big Data, and not only large amounts of data.

When technical progress led to better processing power, better storage capacity and new analytical models, BI started to include new types of data that used to be too complex to handle with traditional analytical models. This is what has been called Big Data. The term, Big Data, might be misinterpreted since it does not necessarily have to do with bigger volumes of data. What might make it more confusing is that there is no general accepted definition of what Big Data is. Although, a commonly used term to describe it is the three V's, which stand for Volume, Velocity and Variety. They describe that Big Data could come in tremendous volumes (Volume), being updated, created and collected in high speed (Velocity) and originated from different sources and come in different forms (Variety).

With so much more data suddenly available, organizations can gain more knowledge and new insights that have the potential to change traditional decision-making processes. Take an ice cream manufacturer for example. Traditionally, the decision makers might request a sales report from the IT department to see how their new product launch went. The new product was a result from R&D testing and the decision makers had a gut feeling that the timing of the release should be in the beginning of summer when the weather is warmer. From the report, the decision makers could analyze if the new product was a success and if they should adjust the price or not. If the company instead implemented a Big Data solution, they could begin by collecting data about the ice cream from different sources, rather than just turn to the internally collected data, in terms of sales figures. One example of using external sources is to "listen" through different channels on what is said about the ice cream, e.g. what are people commenting about the product on social medias. In this way, the company can understand if the new product was appreciated or not, rather than having to make a qualified guess based on the sales figures. They can also detect why the product was liked or disliked. Other external sources to use are weather data, shopping behavior in stores; sources of data that can explain and predict the sales of the ice cream. Already, the amount of collected data has increased dramatically compared to the previous way of working with data. Through a Big Data solution, this data is accessible at all times; the decision makers do not have to wait for the IT department to first gather the essential data, only for them to sort and provide a sufficient analysis of the data. With machine learning, the company can create analysis models that find patterns and generate optimal decisions from the data. A Big Data solution can help the company to understand market needs and customer behaviors in order to facilitate for the company in their innovation process. The decision makers could get information on when, where and at what price to optimally release the product. By also applying the Big Data solution on in-house processes, the company could not only create more value but also lower its costs by optimizing its supply chain.

As shown above, Big Data has huge potential and has also led to a huge hype. It has even been compared to oil and how the fossil fuel drove the economy during the

beginning of the last century. Dillow (2013) means that Big Data will be of the same importance during this century. Still, there are several reasons why many organizations have not yet discovered the world of Big Data. First of all, this field of BI is relatively new. Far from everyone knows what it is or what its potentials are. Also, as for now, Big Data is not for everyone. Far from every company handles data of such complexity that it needs huge data warehouses and complex analytical models to handle it. Last but not least, Big Data is difficult. "*Companies struggle to fully use their data*", a statement found in Accenture's Tech Vision 2015 (73). It further states that "*only 28 % of businesses believe that they are generating strategic value from the collected data*". These are a few of the reasons why some companies are undecided about Big Data and have not yet started the implementation of it. Questions that arises when thinking about implementing Big Data solutions are how much value will it create? What will our customers say about us if we collect their personal information? How can we use the data optimally? Do we have the right competence? What investments are necessary? What organizational and process changes do we need to make? How can we use Big Data to create higher customer satisfaction? What happens if we do not get on board on the Big Data-train? The case of this study, E.ON Elnät, is a company who is dealing with similar questions regarding their continuation of a Big Data implementation.

1.2 E.ON Elnät presenting an idea

E.ON is a European holding company based in Germany who produces and delivers energy to the European, Russian and North American market through electricity, gas, heat, cooling and waste treatment. On the Swedish market, E.ON Elnät is in charge of the power distribution network. They build new sites and base stations and connect both private customers and power plants to the electric grid system. Their main activities include to support and improve the existing grid, extend the grid to new areas and to price the use of the grids. Today, E.ON Elnät has almost one million customers connected to their grid system and more are being connected all the time.

At the moment, E.ON Elnät is about to upgrade some of their equipment that is used to measure energy consumption. An upgrade would expand the number of channels available for transmitting information from the customers to E.ON Elnät. It would also use a cloud solution to deliver the data in near real time to E.ON Elnät. At this stage, E.ON Elnät realized a potential the update would bring and reached out to us for an initial study to review what strategy they should develop to handle this. Also, E.ON Elnät had begun a Big Data initiative but was uncertain on how to continue. After our initial study, we found it logical to broaden the scope of the thesis and look at E.ON Elnät's overall data handling from a Big Data perspective, and not only from a real time data perspective.

From an academic standpoint, Big Data is still relatively unexplored. The main development of new analysis models and application areas is driven by successful companies such as Google, Amazon, and Facebook. These companies are pioneers in the field of Big Data as they have built their business around it. An initial literature study revealed that there also is an academic gap in understanding how different companies are using Big Data and how it is used to create value.

When E.ON Elnät's questions and their plan for a Big Data implementation were presented to us, and the initial literature research showed that there is a gap between organizations' and the academia's insights about Big Data, we had identified a relevant area to study. Through studying organizations working with Big Data and identifying success factors, we strive to help E.ON Elnät, and companies alike, to succeed with and create value from their Big Data implementation. Generic findings are likely of interest for other organizations as well, regardless of where they are in the process of implementing a Big Data solution.

1.3 Research question

Based on what has been said earlier, our research question is:

What are the first steps for an organization to take towards creating value from Big Data?

1.4 Purpose of the study

Based on the question above, the purpose of this study is to explore the first steps organizations can take in creating value from Big Data.

By *explore*, we mean to gain a deeper understanding of the phenomenon of Big Data and its relation to organizations. We are set out to collect and systemize the data into greater insights than done before.

Create value can either be in higher revenue streams, prevent a loss of revenue or to reduce costs.

1.5 Delimitations

Due to the explorative purpose, we have chosen an inductive approach. With this said, we have chosen not to limit ourselves from the beginning, but done so along the way of the study. Our purpose is not to uncover detailed insights, but rather to understand Big Data from a greater perspective. We have therefore not limited us to any specific field within Big Data. Instead, we have limited us to a specific time in the Big Data implementation. We have focused on the past and the present of successful

companies. Rather than looking at future possibilities, we have searched for success factors and present activities.

2 Methodology

The purpose of this section is to thoroughly describe how the study was conducted, in order for others to replicate it. This chapter describes the case study on E.ON Elnät, the methodological approach and the working process. Lastly, reasoning about the credibility, as well as criticism of the sources, is brought.

2.1 The case of E.ON Elnät

As mentioned above, E.ON Elnät approached us wondering how they could create value from their vast amount of data. To better understand E.ON Elnät's situation we issued interviews with employees within the company and took part in meetings regarding the development of their data handling. At this stage, the topic Big Data was not set. It was first later in the process, when we found practical problems at E.ON Elnät, that we started to see how a Big Data solution could be value creating for the company.

2.1.1 The choice of E.ON Elnät

E.ON Elnät is a relevant case for this study as they are an example of a company that has not yet developed a comprehensive Big Data strategy, but at the same time finds it interesting and sees its potential. They also have several issues that could be solved with a Big Data solution. The case of E.ON Elnät is an example of the knowledge gap we have found from an academic perspective; Big Data is a young and blurred landscape with questions still unanswered and the case of E.ON Elnät defines some of those questions. Therefore, as we had found E.ON Elnät, we looked no further for other case studies. According to us, we had found the perfect case.

2.1.2 The study on E.ON Elnät

The interviews with E.ON Elnät employees were conducted in a qualitative manner where we interviewed eight different employees within the company. The purpose with the interviews was first and foremost to understand the organization from a data-handling point of view. What are their issues? What visions do they have? How would they welcome a new strategy? We were focused on understanding their issues and problems, and how they could be solved. It was also important for us to understand what their daily work looked like and understand the different departments within E.ON Elnät and how they interacted with each other. The selection of participants at E.ON Elnät was done according to either their knowledge within data handling or their positions within Business Development.

The meetings we took part in were focused on the development of E.ON Elnät's data handling. E.ON Elnät had a few projects running at the time we started to observe them. We dedicated time to monitor these projects to better understand what issues E.ON Elnät were struggling with, how they were trying to solve them and to see how these projects might correlate with our thesis.

Through interviews and by taking part in meetings, we gained insight in what role data has within E.ON Elnät and what issues they are struggling with. We identified a number of challenges that potentially could be solved with the use of a Big Data solution. These will be explained further in the next section.

2.1.3 E.ON Elnät's challenges

For E.ON Elnät it is important to understand how their grid works. What factors affect the grid? When, where and why does it break down and how can this be prevented? These are questions that E.ON Elnät struggles to answer in detail. Below follows practical examples of these, henceforth referred to *use cases*. The use cases will follow throughout the study, as they will exemplify how a Big Data solution can be of value for E.ON Elnät.

Use case 1: Breakdown in transformers

A commonly used transformer that E.ON Elnät uses in their grid was expected to last for about 40 years. It is now time to change these, before they start to break. When one breaks, the grid takes damage and customers get affected. E.ON Elnät is interested in understanding when and where a transformer is going to break. With this insight, they could be proactive and only replace transformers that are about to break and keep the working transformers for as long as they work. They would also like to know how to operate the grid in order to make the transformers last for as long as possible.

Use case 2: Capacity in feeders

Feeders, or overhead conductors, are used to transport electric energy through the grid system. When energy is transmitted through the feeders, they generate heat and gets more flexible and stretched. The gravitational pull on an overheated conductor can cause it to over-stretch and cause residual damage. How much a feeder can endure depends on the heat generated within, outside temperature, external extra weight (like birds, snow or ice), wind levels and the model of the feeder. Today, E.ON Elnät makes qualified guesses regarding what capacity the grid has. However, they are interested in understanding the exact capacity and how it differs through time.

Use case 3: Extending and improving the grid system

E.ON Elnät puts millions of euros every year in different projects to extend and improve their grid system. For E.ON Elnät, it is important to understand which projects that would generate the highest return. They want to understand where the grid is in greatest need of maintenance and where the most valuable customers are to be found, as those are the places where they should extend their grid system.

2.2 Methodological approach

In order to study how other organizations have handled a Big Data implementation, the purpose is explorative, meaning that we intend to in depth understand how something works or is performed (Höst, Regnell and Runeson, 2006). Due to the limited previously done research, an explorative purpose was considered suitable (Patel and Tebelius, 1987). Our purpose is therefore directed towards the collection and systemization of data, rather than focusing on making generalizations from the data. The style of the purpose fits well with the inductive approach of being open in mind to the empirical findings and making conclusions based on them, rather than trying to fit the empirical findings into a chosen theory. We strived to keep an as inductive approach as possible, implying that we begun the research by collecting empirical findings, and from those we could conclude our own theoretical contribution (Arbnor and Bjerke, 2009). However, an initial literature review was done in order to find an existing phenomenon to study.

When choosing an inductive approach, it is most suitable to perform a qualitative study, which has been the chosen way for the data collection of primary sources (Patel and Tebelius, 1987; Bryman and Bell, 2005). However, as the study proceeded, the more we followed a deductive research as we wanted to make the analysis based on both empirical findings and previously done academic research (Bryman and Bell, 2005). This is in line with the criticism of induction presented by Popper (1963/65) who claims that induction is an impossible operation as "*induction is not presuppositionless*" (Morse and Mitcham, 2002).

Based on our research approach, the study has been performed in accordance with the principles of grounded theory (Bryman and Bell, 2005). In line with this theory, we have been able to have a close connection between the gathered data, the analysis, and the final theoretical contribution. Further, the method has been directed towards developing a theoretical contribution based on the gathered data, with the consequence that the gathering and analysis of data have been done simultaneously, and in interaction with each other (Bryman and Bell, 2005).

Also, the methodology has been chosen in accordance with the explorative purpose (Höst, Regnell and Runeson, 2006) as case studies are traditionally viewed as of an explorative nature (Patel and Tebelius, 1987). The method is primarily based on

qualitative interviews with the purpose of finding how organizations have handled a Big Data implementation. The findings have then been summarized and applied to the case of E.ON Elnät. Moreover, secondary sources in form of literature reviews have been used. Through the use of different methods and different kinds of data, we have gotten ourselves a better overview of the area of the study. In other words, we have triangulated our method and sources to increase the trustworthiness of the study and to give a better image of the observed phenomenon (Höst, Regnell and Runeson, 2006; Bryman and Bell, 2005).

2.3 Working process

Figure 2 illustrates the working process. The steps will be explained in further detail below the figure.

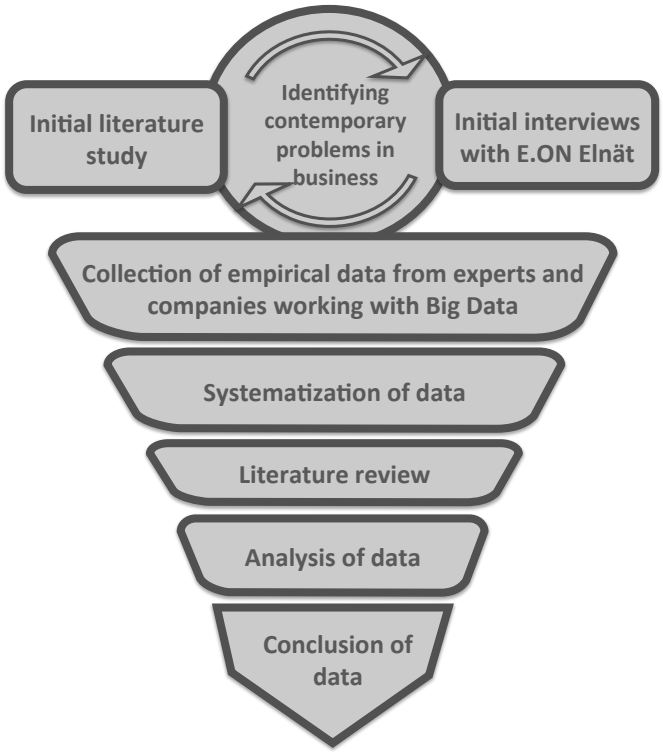


Figure 2 *Illustration of the working process*

2.3.1 Identifying contemporary problems in business

As mentioned above, an initial literature study together with interviews at E.ON Elnät helped us to identify Big Data as a research field with practical relevance and where we could make an academic contribution.

2.3.2 The collection of empirical data

The empirical data was collected through semi-structured interviews with experts and organizations working with Big Data. This structure on interviews was chosen as it allowed us to be flexible towards the answers the interviewees gave. It made it possible for us to follow up on interesting leads, which would not have been possible if we conducted a regular survey. The structure on the interviews is characterized by an interview guide with different question areas. When using this method, the questions asked went from being openly directed to be more structured and direct. As the interviewer, you are allowed to pose the questions in different ways and the interview is steered in the way where the respondent has the most to say (Höst, Regnell, and Runeson, 2006). This was done in order to avoid the interviewee to feel forced to give an answer to a specific question. Also, this structure was chosen as it was to make the respondents more comfortable as they were able to speak freely about the subject.

The interview guides were developed according to an interview technique that divided the interview into different parts (Höst, Regnell and Runeson, 2006). Two question guides were developed; one for experts, and one for organizations working with Big Data. We chose to divide our interviewees into these categories as we believe that their answers will differ depending on if you have been inside an organization implementing Big Data, or if you have been an observer. However, the phases of the interview were the same regardless of the interviewee: presentation of us, further introduction to our subject and why the respondent was chosen, followed by time for the respondent to present himself/herself with work experience and present role. After these brief introductions, the prepared questions were asked. The interviews were finished by asking if the respondent wanted to add something or shed light to something that we might have missed. In most cases, this led to a repetition of what had already been said, which highlighted what the respondent thought as most important during the interview.

Further, this approach made the interviews different from each other, all depending on the respondents' answers and how much they had to say and could elaborate on the questions asked. The interviews were held in person, over telephone and over Skype. Not being able to see the respondent in the face might have made us miss important facial expressions. However, the subject is of the kind that we believe such notifications are of less importance for the result of the study. In accordance with this type of study, the interviews were recorded. They were done so in order

for the authors to go back and listen to exactly what was said, and in that way eliminate misunderstandings and the need for clarification of the respondents (Höst, Regnell, and Runeson, 2006). In the cases that we were not allowed to record, the interviewees had a great comprehension towards us taking notes and to the somewhat slower interview.

It is important to note that different timeframes were given for the interviews with the participants, ranging between 30-90 minutes. With this said, not all questions were posed to each participant. During the interviews, we had to prioritize the questions in order to make sure that the most important ones were answered. This type of prioritizing might have an effect on the neutrality of the study as we gave the questions whose answers we felt were saturated, a lower priority. However, time was always given to question whether we could come back with follow-up questions if we would find it necessary. Solely, the answer has been yes. Another important mark to make is the development of the authors' knowledge within the studied area. For each interview, we had more information than previously. This might have affected the way the questions were posed and foremost, which the follow-up questions were. This is not necessarily something negative. Due to the vast number of interviews held, it only means that the most recent interviews resulted in more concrete answers than the ones in the beginning, which on one hand were needed in order to increase our knowledge and to "get in the game" of Big Data.

According to von Diether (2015), when conducting a qualitative study and the interviews are done with the goal of understanding experiences and perceptions of the respondents, a number of 10-12 interviews might be sufficient. We had the privilege to interview six experts and nine organizations, which made us reach saturation regarding the answers we received.

Experts

Within the selection of experts falls professors and consultants working with Big Data. These experts were chosen due to their expertise within the studied field. The focus of the questions was to get an overall and an academic side of the phenomenon. See Appendix 1 for the questions. The majority of experts had a background within the academia and could therefore contribute with a relatively nuanced view of the phenomenon. Furthermore, they were not influenced or limited by an organization's culture and politics. In some sense, they could speak more freely about the subject than the organizational representatives could.

Organizations working with Big Data

Interviews were also held with nine organizations that had already experienced the transaction phase, or were just in the start-up phase, to implement Big Data Analytics in their everyday work. The organizations acted within different industries, ranging from banks, grocery retailer, IT companies with focus towards

the automotive industry, telecom, travel and media industry. This has given us first-hand data on how some organizations have handled and are still handling this type of data. The interviews have been conducted with the goal of identifying the background and reason to the outcome of their Big Data-handling, and accordingly with the purpose, how the organization had created actual value from the Big Data implementation. The participants were chosen due to their positions within their organization. The questions were developed with the focus on mapping what steps each organization had taken towards their Big Data implementation, see Appendix 2 for the questions.

2.3.3 Systemization of data - the development of the four themes

When the collection of the empirical data was done, we did a systemization of the findings. While going through the findings from the interviews, we were able to cluster the answers into different categories, which is in alignment with how categories are developed within grounded theory (Bryman and Bell, 2005). Four themes were reached, and these are subjects that were touched upon in many interviews. The themes are organizational structure, Process Analytics[2], Customer Analytics[3] and ethics. Organizational structure includes top management support for Big Data projects, working in cross-functional teams and finding the right competence. Process Analytics consists of how the organization can be made more efficient internally speaking. Customer Analytics focuses externally by looking at how customers can be more satisfied with personalized offers for example. The last theme is about ethics and how ethical standpoints affect the outcome of the Big Data collection and therefore the analysis of it. During our interviews, the ethical aspect of collecting personal data recurred as a theme during every interview held.

2.3.4 Literature review

In order to complement the empirical findings, a study of academic literature has been conducted. The secondary sources consist of academic research papers, articles and books. One purpose of studying the secondary sources is to find the academic definitions to concepts used throughout the study. Moreover, these sources are used to give additional perspectives and a deeper understanding for the empirical findings.

[2] Process Analytics refers to the analyses of internal processes, how processes can be made more efficient. These processes are aiming to improve the organization internally

[3] Customer Analytics refers to the analyses of external processes, for example how customer knowledge can be increased. These processes are aiming to improve customer satisfaction and to increase customer loyalty

The research of secondary sources has circled around the themes we developed: Big Data, organizational change, process efficiency, customer knowledge and ethics. It has been important to study the phenomenon of Big Data as it is widely debated and still quite unexplored. The others were chosen based on our four themes in order to get more depth while analyzing them.

During the literature study, we noticed a circulation of references. Most of the articles on Big Data are referring to and citing the same authors. This leads to foremost two interpretations. There are a small number of authors, whose only choice is to cite each other. The second interpretation is that these sources are the most trustworthy Big Data-sources to be found. Further, the selection of secondary sources regarding data has been based on the date of publication. Due to the fast development within this field, sources treating data that are ten years old are quite outdated, while they might have been newly published within another field of study.

Lastly, this section covers a literature study on how interviews are to be structured and how to handle what is said during the interviews, in order to get a result as correct and truthful as possible.

2.3.5 Analysis of data

The analysis is based on the empirical findings from the interviews with experts and organizations working with Big Data. It is also based on the theoretical findings regarding the four themes that were developed after the systemization of data. The theoretical findings either supported or rejected the empirical findings. The analysis, together with the findings, is presented in chapter 5. After this, the analysis was applied to the case of E.ON Elnät in order to present recommendations for them on their next step in their Big Data implementation.

2.3.6 Conclusions of data

The conclusions drawn are based on the analysis of the findings. It was made sure that the conclusions answered to the research question and the purpose of the study. Furthermore, the recommendation to E.ON Elnät is clearly stated within this section. The conclusions are an example of how our findings can be applied in reality. Our strive is not to present generalizable conclusions, as that cannot be made when conducting a case study on only one organization (Höst, Regnell and Runeson, 2006). Instead we have collected and systemized the data in order to increase insights within this field.

2.4 Credibility of the study

The area of Big Data has been very actual for our interviewees, which has led to a sense of relevance for them to participate in this study. This has hopefully made

them more eager to give personal opinions; something that increases the applicability of this study (Patel and Tebelius, 1987).

The honesty of personal opinions is also sought after when keeping the study as trustworthy as possible. It is essential for the interviewees to perceive the subject as relevant for them in order to give genuine experiences and feelings towards the problem (Patel and Tebelius, 1987). The choice of recording the interviews is further increasing the trustworthiness, as we have been able to listen to the interviews many times and correct potential misinterpretations. Also, as we are two authors, we perceive the answers differently which has contributed to keeping the interpretations as objective as possible. Lastly, the interviewees have been given the chance to examine the text that is written about them and the potential quotes used. This has further contributed to the "correct" and neutral interpretation of the empirical data.

The second term to relate to when conducting a qualitative study is reasonableness. How can we make sure that the data we have collected is reasonable? The reasonableness in this study lies partly in the way that we have applied the analysis on a case study. In this way, we got to test our interpretations on an organization. Further, the numerous interviews have led to a fair amount of material to analyze, which suffices for us in order to systemize the data into different categories and to be able to make valuable recommendations for E.ON Elnät. However, there has been less possibility to detect the discrepancy between words and actions, e.g. study how the organizations actually have handled the access to Big Data and Big Data Analytics. It decreases the reasonableness of the study. Though, the empirical findings were put in comparison to the theoretical findings, which increased the reasonableness as most of the findings were in agreement.

Conscientious and honesty are further important words to take into account when conducting a qualitative study (Patel and Tebelius, 1987). As pointed out before, through being two authors, we have decreased the effect of subjectiveness. Our goal has been to underpin each interpretation with both the empirical findings as well as with the theoretical findings. We hope that our extensive methodology chapter will help to understand how we have reasoned about certain issues and how we have been able to make the conclusions that we have drawn.

2.5 Criticism of sources

We have focused on hearing different organizations' relation to Big Data, rather than hearing a number of employees within the same organization. By only interviewing one person from an organization, the risk of personal opinions affecting our overall impression is greater than if more people were interviewed within the same organization. If the study were performed again, this might be a reason if the

findings were to differ. Another employee within the same organization might have a different opinion and interpretation of the events that took place in relation to the implementation of Big Data. Moreover, we are unaware of how much the interviewees revealed or how many details they left out. This limits the trustworthiness of the study. However, we have chosen to believe that the responses we have got are reliable and still give a sufficient indication of the best approach towards the challenge of implementing Big Data Analytics.

3 Big Data

The purpose of this chapter is to explain the basic principles of Big Data and to introduce the reader to common expressions, such as Big Data Analytics, Data Lake and Internet of Things. We find this necessary in order for the reader to understand the following chapters.

3.1 The definition of Big Data

As mentioned in the Introduction, Big Data has become an extremely popular term despite being relatively undefined (De Mauro, Greco and Grimaldi, 2015). Many talk about the three V's (volume, velocity, variety), others also include a fourth - veracity (IBM, 2015), referring to the uncertainty of the collected data. In some circuits, it is even common with a fifth V - the value of data. However, the chosen definition in this study is that Big Data "*represents the information assets characterized by such a high volume, velocity and variety to require specific technology and analytical methods for its transformation into value*" (De Mauro, Greco, and Grimaldi, 2015:8). Moreover, many authors point out that Big Data cannot be analyzed with traditional methods; a development of efficient methods and technologies is therefore needed (Chen, Mao, and Liu, 2014). This definition is left with the remark that Big Data needs to be set in relation to "*an organization's capacity to generate, manage and make sense of it*" (Tableau Software, 2013). Of all the studied definitions, this one is dynamic and gives consideration to the size of the organization, rather than the size of the data. Furthermore, it is timeless as this definition is free from any restrictions regarding volume, variety and velocity. This is important since a definition the V's of today, might not correspond to that of tomorrow.

3.2 Big Data Analytics

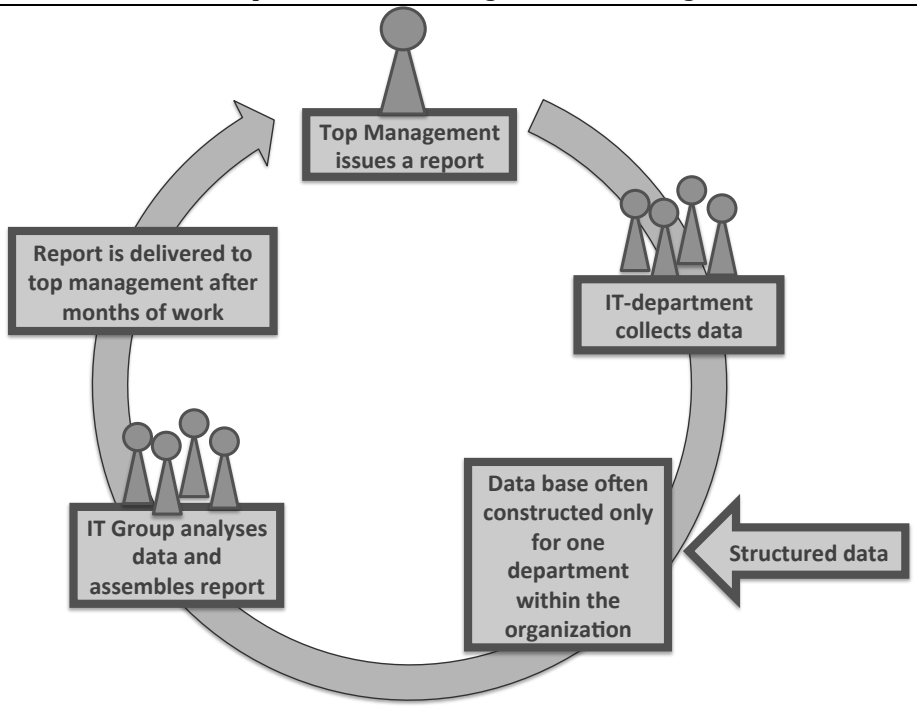
Thomas H. Davenport and Jill Dyché (2013) divide the ages of Business Intelligence (BI) into three eras; from Analytics 1.0, which started in the 1950's, to Analytics 2.0, which is when Big Data was firstly introduced in 2005, to Analytics 3.0, which is where we are at today, and can be described as Analytics 1.0 and 2.0 combined. The big differences between 1.0 and 3.0 are: (1) the use of external data, (2) the use of unstructured data and (3) the use of prescriptive analysis.

As mentioned above, with the right tools, more data can result in more knowledge. In order to understand a behavior or phenomenon, it makes sense to collect all possible data that affects it. Therefore, in the era of Analytics 3.0, to collect data, known as *data mining*, from external sources is fundamental. It is a way to get a more holistic view and thereby a better understanding for the behavior or

phenomenon. A large grocery retailer could for example monitor diet trends in magazines and social media to better understand future customer demands.

Data can come in many forms; text, sound, video, picture, spreadsheets and so on. During the era of 1.0, many of these sources were not available for analysis, mainly because they were too complex. Instead, organizations relied on structured and organized sources of data, like internally produced spreadsheets. Great improvements within analytics have in time made the more complex sources an obvious choice to include. Since so much information is constantly being shared through different types of media, it is not only interesting to collect and analyze this data, but also to combine the different data sources in one single analysis. It is when numerous data sources can be used simultaneously to describe one phenomenon that it becomes clearer; one might say that the image resolution increases.

Regardless of what era, 1.0, 2.0 or 3.0, data mining needs to be stored. This is done in data warehouses, also known as *data lakes*. These warehouses differ a lot, but the basic idea remains the same throughout all eras except in terms of accessibility. Many organizations choose to have a so called *cloud solution* which means that the data is accessible wirelessly from any device it is connected to (Bughin, Chui and Manyika, 2010). By constantly mining, and thereby creating huge data lakes, organizations always have access to data and no longer have to wait for an IT department to assemble it, which during Analytics 1.0 could take months (Davenport and Dyché, 2013) (see Figure 3).



Figur 1 *Business Intelligence before Big Data (Analytics 1.0) where mining data on demand and assembling a report could be a time consuming process*

By having intelligent models constantly analyzing the data lake, organizations can use Big Data Analytics to constantly look for patterns and correlations in the data set. In this way, the analysis model can deliver answers to questions the organization did not know to ask. Successful organizations have been able to go from being *late binders*, having to wait for IT-department to mine data and wait for an analysis, into becoming *early binders,* meaning faster deliveries and constant access to data (see Figure 4).

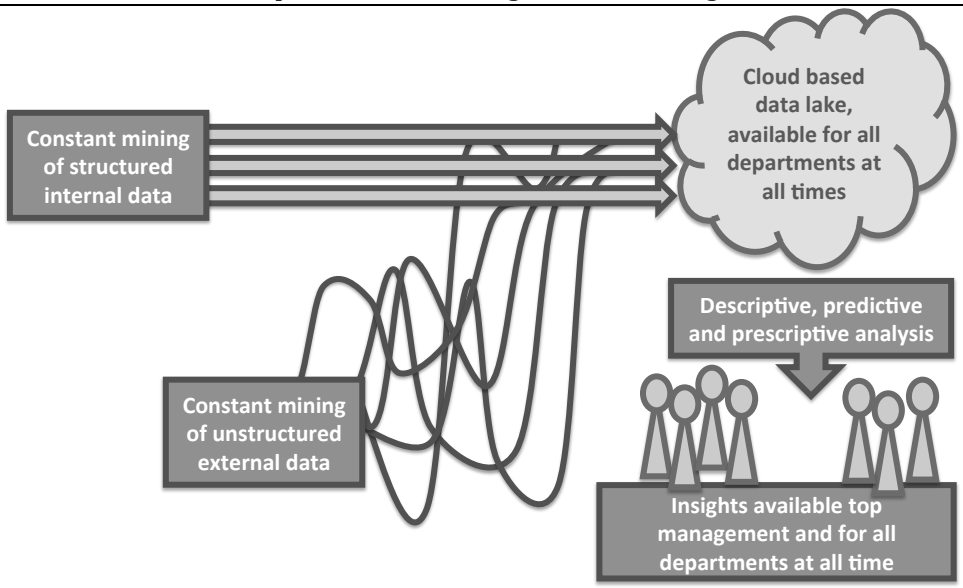


Figure 3 *Analytics 3.0 with constant data mining. The data is stored in a data lake that is accessible for all departments*

The successful organizations are better at using Big Data Analytics overall. A survey conducted by the MIT Sloan Management Review and the IBM Institute for Business Value resulted in the conclusion that "*top-performing organizations use analytics five times more than lower performers*" (LaValle et al., 2011). With this said, organizations do benefit from data analysis and it is therefore something many should include in their businesses. Moreover, the same study showed that six out of ten were of the opinion that the organization had more data than it could use efficiently. This indicates the great potential many organizations have without using Big Data Analytics to its full potential.

3.3 Internet of Things

Another buzzword, strongly connected to Big Data, is *Internet of Things* (IoT) (Bughin, Chui and Manyika, 2010). The idea is that physical objects communicate by connecting to a wireless infrastructure, like the internet. Imagine your refrigerator telling your shopping list app what products can be found in the refrigerator and what groceries you need to buy. Organizations might use this technique to gain additional data from their products. By equipping products with sensors that communicate back to the manufacturer, producers can understand how their products are being used, when they are being used and when they are breaking down. This is something that has been adopted by the car industry where a modern car might be equipped with up to 100 sensors, whose data could be sent back to the producer (IBM, 2015).

4 Empirical findings

This chapter presents the empirical findings from the interviews with organizations and Big Data experts, which are arranged in different topics. The findings include a deeper understanding of what Big Data is; technical aspects; opportunities and threats; cross-functional teams; top management support; supply of competence; ethics and application areas, all in relation to Big Data.

Understanding Big Data and having a pronounced entrance plan

All of the expert interviewees agree on the difficulties and the importance of understanding what Big Data is, and how it can be used to create value. A management consultant reasons that Big Data is a buzzword partly because few people actually understands what it is and what it is all about. This creates confusion amongst companies. Organizational respondents agree on this point. A bank representative, among other company interviewees, describes how this digital development is pushed by suppliers of Big Data solutions, and that these suppliers point to a greater need than there actually is. Both types of respondents emphasize the importance of having a stated entrance plan before investing in a Big Data solution, although the opinion about having a plan seems to differ between the two. Some of the company interviewees describe the Big Data landscape as unexplored and that one should use an innovative approach and open mindset to what will come out of it. These respondents also describe the importance of having a flexible and cloud-based solution. A better tactic, according to other company interviewees, is to investigate what insights you need and implement a solution that helps you find those insights. They instead describe the importance of creating a Big Data solution that is not too big to handle and helps staying focused on the goal. Somewhere in the middle are most of the expert interviewees, who believe that an organization should investigate what data they have access to and invest in a solution that could create value from that data. Above all, experts with a background as consultants repeatedly focus on the value creation. They emphasize the need of a clear goal and a solution that maximizes the value creation within the organization.

What was mentioned amongst both groups was the great use of use cases, defined as practical examples presented in an easy and cost-effective way. They are used to introduce Big Data within the organization in an illustrative way and show how value can be created. Use cases have been described as a way of engaging and involving either top management or other important parts of the organization. When a grocery retailer representative asked employees what issues they were struggling with and how a Big Data solution could help, he compared his responses of “getting reports faster” to the response Henry Ford got when he asked people about what type of transportation they needed: “faster horses”. The use cases help

different departments to understand the value of a Big Data solution and to see its application. Amongst the experts, a consultant also mentioned how they had helped companies conduct use cases. However, experts from the academia never mentioned use cases during the interviews.

Technical aspects and technical challenges of Big Data

The technical parts of a Big Data solution are neither expensive nor difficult to physically get in place, something all of the respondents agree on. For example, the very popular open source database software, Hadoop, is for free. However, one generic difficulty among the companies we interviewed was the mentality regarding this digital change. A successful Big Data solution seems to demand a lot of attention and concern many different parts of the organization. Some of the large companies who existed for a long time describe that it is time consuming to adapt to this type of IT-system. However, an IT company interviewee remembers that it previously could take 60-80% of a project's dedicated time only to gather and structure relevant data, a percentage they strive to shorten as the data can be found in a data lake.

A generic challenge seems to lie in how the technical parts interact with each other, and how they co-exist with physical channels. One expert describes the importance of having a strategy on how one's digital and physical channel can co-exist with each other; "*You cannot run your offline sales online, making them almost competing channels*". The expert continues that if an organization has one strategy for the regular activities, and one for the Big Data handling, there is a great risk that these strategies will cannibalize on each other. Instead, organizations should align the strategies and in that way create synergy. This is something that is supported by a representative from a media company and one of the banks. Further, the bank has experienced a similar situation. When going from a traditional office-based service to a digital version, the bank saved a lot of money in infrastructure but at the same time lost the customer interaction. It was only later that the bank realized that this interaction is essential in order to understand the customer segment and market needs. The bank had to improve the digital channel and implement a way to understand how the channel was used, what customers needed and how it could be improved. Today, 90% of all interaction with the bank goes through the digital channel, which makes it the greatest source for collecting useful data.

Today, the technical barriers of Big Data are not an issue for most companies. One expert points out that "*we no longer need as advanced analysis models as before, but can still generate very good results*". Another expert agrees with this, and points to that the challenge lies in getting the right competence in the right place. In addition, the technical challenge lies in building a system that can answer to questions you did not know you wanted answers to. Moreover, it is stated during one of the interviews with an expert that it is of extreme importance to build scalable systems; "*If you today want a system managing 1000 users, you rarely build it for 1000 or 10*

000 users - you build it for an endless number of users. You always build scalable with the background of Big Data today". Together with this insight, it is also pointed out that in order for organizations to succeed with their Big Data handling, a great technological shift is necessary within the organization. A telecom representative talks about a paradigm shift. It is however in the sense of accessibility; you no longer need to ask the IT department for a report. The data is now accessible for everyone within the organization.

Opportunities and threats of Big Data

Both groups of interviewees agree that Big Data poses great possibilities. What only experts and a few companies mentioned were what threats Big Data brings and the need to be aware of them. In some industries, Big Data introduces new competitors. AirBnB is an example that would not have existed without Big Data and it has come to shake the hotel industry. A representative from the travel industry describes how a relatively small competitor but with a great app could take huge market shares. In other words, every company with the same intention is somewhat of a competitor, e.g. if potential customers use Google to plan their vacation, Google is a competitor. Banks, travel agency and grocery retail representatives emphasize how customer loyalty tends to disappear in a digital market. A bank representative states that "*with a digital bank it is difficult to accumulate loyalty. Instead customers will turn to the best products. It is therefore essential to have a quick product development loop in order to keep customers*". Even in the travel industry there is a need for quick reactions; a travel company representative describes that "*if we get a contract from a new hotel at one of our destinations we have the hotel available for rent on our website within 10 minutes*". A process that previously could take two weeks.

Another market opportunity is to sell data. However, a management consultant thinks that it could be risky to sell raw data from your business. Referring to personally experienced cases, few organizations that sell raw data are successful. The expert continues that competitors get insights in your market and these competitors have a tendency of being better at creating value from the data than the seller.

Cross-functional teams

Another common insight amongst experts and companies is that a successful Big Data implementation goes hand in hand with cross-functional teams. Walls between traditional departments need to disappear in order to use the full potential of Big Data. Apparently, it can often be difficult for the marketing department to understand how their insights can help for example product development, but that is one of the strengths with Big Data. Different departments should collect data together and not individually, and make sure that this data is accessible for all departments and partners who need it. Breaking down this silo-thinking has been mentioned in almost every interview with companies and mentioned as something

essential for the Big Data implementation. Some of the experts describe how political interests might come in the way of this and that there is a resistance among departments to share the data that they have collected. "*It is often in the silo-thinking that companies fail when it comes to implementing Big Data*" according to a Big Data expert. With new teams, where members from all different departments work close with data scientists and architectures, a company is getting closer in using Big Data to its full potential.

Top management support

Top management support is a popular term used during the interviews. A telecom interviewee summarizes that it has been easy to convince the top management of the way that data can be capitalized on and that they therefore should use it more efficiently. A management consultant concludes that the projects where the Big Data implementation has become most successful is within the organizations that have lifted the Big Data issue to top management level and made it a top priority throughout the whole organization. Furthermore, it is stated that it is not enough to hire a data analyst, "*in order to succeed you need to integrate [Big Data] into all its processes and lift it to a much higher level*". The consultant further states that a holistic perspective on the Big Data handling is necessary; something that is initiated from top management. Also, an expert mentions that it is important that the employees working with Big Data want to work with it. This is something that the top management can contribute with through showing support for the Big Data projects.

Top management also has huge impact in creating and supporting the cross-functional teams. In order for the teams to succeed, many interviewees talk about the need of a CDO, CAO or CIO (Chief Data Officer, Chief Analytics Officer or Chief Information Officer). Almost all respondents emphasis that employees working with Big Data should be included in the management team in order to always get the Big Data perspective in the decision-making process.

The search for the right competence

Almost all of the interviewees agree that getting the right competence is of great importance, but somewhat troubling. Only companies that are early in their implementation phase say that they believe they have the necessary competence in-house, but that they might have to look outside of the company's borders later in the project. Within the expert group, all agree that companies need experience and competence that cannot be found within the company borders. When implementing a Big Data solution, most companies need additional analytics skills and new data architectures. Since the software and platforms, like Hadoop, are young and not so well developed, they can be difficult to work with if you do not have the right skills. One issue seems to be that the field of Big Data is young and there are few senior data scientists with this skillset. In order to get the right skillset, according to our

interviewees, it is common to use different types of partnership. The IT company with focus on the automotive industry had a close relationship with the close by university when they developed their use cases. A telecom organization uses different partnerships to get quick access to knowledge and skills in their early phase. A grocery retailer, who have come a long way with their Big Data handling, still uses partners to trade data and to make sure they have the right analytical skills at all time.

The issues of ethics when working with Big Data

Many of the companies raised the impact of ethics in the world of Big Data. They described the fear of ethical missteps as something that sometimes hinders the development and use of Big Data. There are a few practical examples of this. Banks notice almost instantly when a family has had a new baby as they can see the deposit of the child benefit. However, they are cautious in sharing this insight with the family itself, as it might be perceived as intruding on personal space. There is a strong belief amongst the companies interviewed that people dislike when a corporation knows intimate and private things about them. The banks therefore find it challenging to use this information without scaring away customers. However, a media company representative states that "*it is almost something the customers expect, they should not need to contact a company when they have moved, but it should happen automatically*", but still without the customers feeling supervised. All of the companies also need to take into account laws and regulations before they handle huge piles of private data. Terms of condition and company policies can also limit organizations in what they can do with the data they have access to. Because of this, some companies conclude that one has to be innovative to handle matters that are of sensitive ethical character.

Experts describe the same situation. They give a picture that companies lack great knowledge in how to handle this and that very few show that they have an ethics strategy to fall back on. One say that as long as customers feel that they get something valuable in return, they are often willing to share their information. Therefore, it is important for companies to make clear what value that is given in return for the information. The IT company with focus on the automotive industry is one of the very few that presents an ethics strategy and describes how the information they collect never is to be used against the user. A reckless driver should never have their insurance premium affected because of the data collected about his/her driving behavior. However, this plan is not bulletproof. In Brazil and Russia, each government has demanded to have access to the location data that is being generated by cars according to the IT company representative. These countries have a different agenda than the company itself, which means that the data could very well be used against the user. Moreover, the relationship with the government is something that a telecom interviewee also explains and addresses as

something that needs to be taken into account when developing an ethics plan on how to handle sensitive data.

Application areas

Experts describe Big Data as something that is of interest for organizations within all industries and in every step of the value chain. Although, depending on where a company is positioned in the value chain, the solution will take different forms. They describe Big Data as something that will have the strongest impact in environments with lots of customer data. The application areas can be divided into having an internal or external focus. Most of the companies interviewed use their Big Data solution to gain customer knowledge; they are focusing externally. However, some companies apply their Big Data to also focus internally, on in-house processes and efficiency. All companies mention that they have applied their Big Data solution to improve customer knowledge, but only half of the companies mention that they have applied their Big Data solution in both areas. A telecom company, for example, uses their Big Data solution to understand customer segments, to listen to customer opinions, to customize products and services and to create targeted advertising, which is the result of analyzing customer data. They also use their Big Data solution to optimize their telecom net and make better decisions when expanding their net, which is an example of how to use a Big Data solution for process efficiency.

"When you enter Elgiganten and ask for a freezer, the seller won't show you a dishwasher". This is an example illustrated by a grocery retailer representative of how customers have perceived organizations' tries to reach them through a digital channel. "*The e-channels have in some way ignored the interaction with the customer. Big Data plays a huge role in adjusting to the context the customer is making contact in"*, a grocery retailer interviewee explains. The same company creates individual coupons based on customers buying behavior as well as analyzing their internal processes, like how they run their stores and how they can streamline purchase of goods. When focusing on customers, the Big Data solution is described as a tool to create value. When being used for internal improvements, it is often described as a tool to lower costs.

Summary of empirical findings

The empirical findings have led to some insights. The insights that are regarded as generalizable, i.e. not company or industry specific, are analyzed further in the next chapter. These insights have been systemized into different themes based on the correlations that have been seen in the empirical findings. One insight is that organizations tend to divide their Big Data handling into either internal improvement, focusing on process efficiency or external improvement, focusing on customer knowledge. Further, one theme treats the organizational structure that lays a good foundation for a Big Data implementation. Lastly, ethics is an unexpected, yet very important theme that was brought up during most interviews.

It was proven that an ethics strategy is something that many organizations lack and should include in their business plans. The four themes have been named Process Analytics, Customer Analytics, Organizational structure and Ethics (see Figure 5).

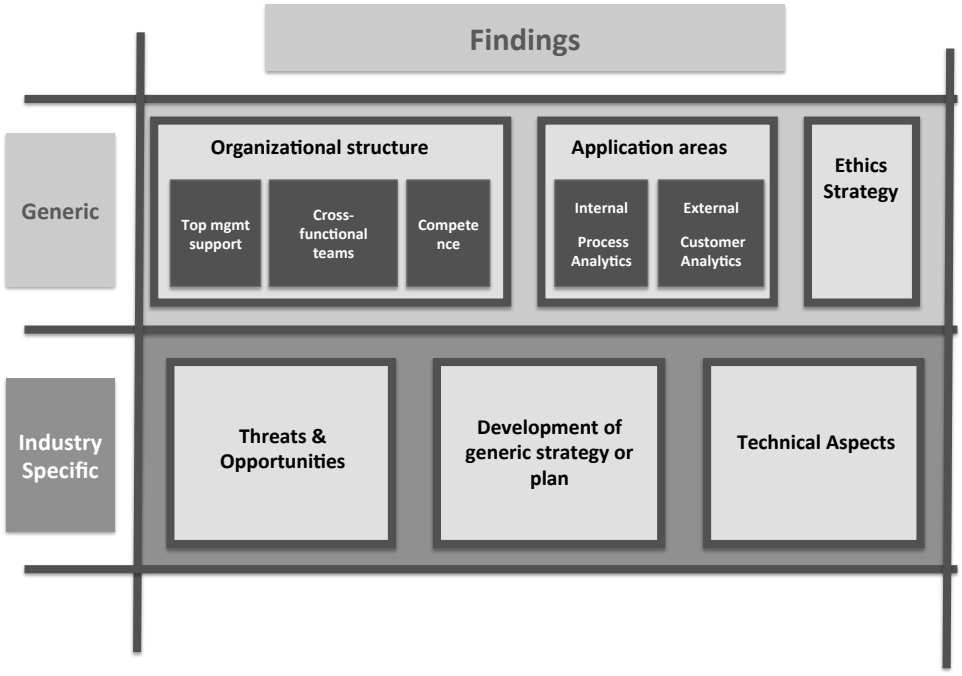


Figure 4 *Empirical findings categorized into either generic or industry specific*

As mentioned in the previous paragraph, organizations tend to focus on either improving their customer knowledge or improving their internal efficiency. This division has been chosen as it differs in the way organizations handle their Big Data implementation; much more regard needs to be taken to personal data when focusing on Customer Analytics for example. Thus, it affects the organization's strategy regarding Big Data. Moreover, Process Analytics and Customer Analytics will help to better understand the wide benefits of Big Data and how it can be used in detail.

Organizational structure includes the terms top management support, cross-functional teams and finding the right competence. These have been recurring words during our interviews. Therefore, they have been mapped together and used for further analysis. This theme sheds light to areas which organizations struggle with or areas of utmost importance in becoming successful in the handling of Big Data. They have identified these areas as contributing success factors. By analyzing

organizational structure to discover how it affects a Big Data implementation, we hope to contribute to a greater understanding of what to do and why.
Furthermore, ethics is a very important topic to discuss and to take into account when discussing Big Data. If doing wrong, it can have devastating effects on the organization's revenues and reputation. The findings also show that few companies have a clear strategy or can reveal successful tactics. Ethics will therefore be analyzed further by involving secondary sources in order to find a generic strategy of how to handle sensitive data.

Lastly, the reasoning behind threats and opportunities is very interesting as it is an obvious evidence of how industries have changed due to Big Data. It has been mentioned in some interviews; however, it will not be discussed further. Both threats and opportunities are regarded as being very industry specific and we believe that it will be difficult to analyze this topic further to find generic conclusions. The same argument is applied to the development of a generic entrance plan for an organization. Also, technical aspects are viewed as too specific based on the organization. Therefore, they will not be analyzed further. This is without saying that these insights are not useful for any organizations' Big Data implementation.

5 Understanding reality in relation to theory

This chapter aims to give the reader deeper knowledge within four of the themes identified during the interviews, namely Process Analytics, Customer Analytics, Organizational structure and Ethics. This chapter combines the empirical findings from experts and organizations working with Big Data, with the theoretical findings, as well as an analysis of them.

5.1 Application areas - Internal and external

Based on the empirical findings, it has been found that organizations tend to apply Big Data onto two different areas: internally such as process efficiency or externally, such as customer knowledge. This section aims to guide the reader through this logic and provide deeper knowledge and understanding for these two areas. It starts by investigating if also the academia agrees on this division. This is done based on a review of Porter's paper on strategy and Osterwalder's view on business models, as the Big Data implementation is viewed as a strategic change within an organization. These were chosen since the implementation demands a certain approach in order to be carried out efficiently and successfully. In addition, the principles of Customer Knowledge Management will be presented in order to increase the knowledge within Customer Analytics.

5.1.1 Two sides of one business

Today, many organizations claim that they are victims to hyper-competition; a term defining a fast-moving competition where organizations need to have dynamic strategies in order to survive on the market, defined by an intense price war and constant strive for improved and more efficient processes (D'Aveni, 1995). However, Porter (1996) claims that the problem is not hyper-competition; it is rather organizations' failures in differentiating strategy from operational effectiveness. These terms can also be interpreted as the external and internal strategy of an organization.

"The essence of strategy is choosing to perform activities differently than rivals do." (Porter, 1996:12)

Porter claims that the view on strategy should change to make managers realize that it is an organization's strategy that really differentiates it from competitors. Otherwise, there is a risk that the strategy will be nothing more than a marketing slogan (Porter, 1996). Operational effectiveness is about doing the same activities, but doing them better than the competitors. It is not only focusing on the

effectiveness, but also takes into account how an organization uses its input resources, for example by reducing defects in products or developing products faster. However, strategic positioning is about doing different activities or doing the same activities as the competitors, but in a different way.

Porter (1996) continues that operational effectiveness will in the end make every organization the same; a potential competitive advantage regarding the internal processes will be smoothed and lead to relative improvement for no one (Porter, 1996). Though it may have improved the operational effectiveness in relative terms. This is where the strategy becomes important. "*Competitive strategy is about being different*" (Porter, 1996:6). Choosing to perform activities in a different way compared to competitors is when an organization can create value that cannot be found anywhere else.

Saying yes to one strategy, means saying no to others. This is something that Porter greatly emphasizes throughout his article. There is a need for trade-offs that organizations tend to ignore or eliminate. However, it can have devastating effects. There needs to be trade-offs in order for an organization to be different from its competitors and to be able to create competitive advantage. "*The essence of strategy is choosing what not to do. Without trade-offs, there would be no need for choices and thus no need for strategy*" (Porter, 1996:12). Porter points to the danger of saying yes to everything, with the risk of not becoming good at any activity and in that way lose market shares, and in the same time become too much alike the competitors. This points to the need for a strategy.

Further, a difference between strategy and operational effectiveness is that the last is about individual activities, while the first mentioned is about the combination of activities. By looking at activities as a whole system, rather than individual parts, it aggravates for competitors to copy only one part of the system, as the activities are all dependent on each other; they are part of a strategic fit. The strategic fit can create competitive advantage and drive superior profitability, thus when one activity's value to a customer is increased with the help of the other activities, the organization performs. In addition, fit means that if one activity is under-performing, the whole system is affected negatively. However, if the same activity is instead performing better than expected, the system will be positively influenced. In order for an organization to create the strategic fit, it is important that especially the managers see the organization as a whole, rather than different components. By discussing core competencies and key success factors, the organization has its focus on individual tasks and therefore loses the holistic perspective. Strategic fit is further important in sustaining a competitive advantage (Porter, 1996).

In the same way as Porter has divided the different types of an organization's overall strategy, the Business Model Canvas has made a similar division. It divides an

organization into cost-driving and revenue-driving activities (Osterwalder and Pigneur, 2010). The cost-driving activities are based in-house: key activities, key resources, and key partners. While revenue-driving activities takes place outside of the organization: channels, customer relationships and customer segments. In line with what both Porter says and what the Business Model Canvas concludes about dividing the strategy or the business in two parts, the empirical findings are showing signs of the same division. Instead of talking about operational effectiveness and strategy as Porter does, or about cost-driving activities and revenue driving as the Business Model Canvas does, the empirical findings are talking about Process Analytics respectively Customer Analytics.

In conclusion, it can be said that the division of the two application areas has support in the academic research. With no more reason to question this division, an analysis of each application area will follow.

5.1.2 Process Analytics

One of the two application areas for Big Data is Process Analytics, which is about activities related to internal effectiveness. Despite that the majority of the interviewed organizations focus on the customer and external improvements, it has been proven that Big Data also can be used to improve internal activities, such as the supply chain. A telecom company concludes that "*Big Data is about making things a little bit smarter and a little bit cheaper, without compromising the quality of the products*". This is where Process Analytics becomes important, as much can be done internally with the help of Big Data.

The Accenture Technology Vision 2015 (2015) states that organizations understand that it is to their strategic benefit to simplify and streamline many aspects of their operations. Furthermore, one interviewed expert mentions the value of automatization, and points out that in the end, it is all about cost savings. Organizations throughout many industries can use it to optimally allocate and coordinate both human and physical resources (Manyika et al., 2011). In addition, Big Data can also be used to reduce costs and to facilitate innovation of new products and services (Manyika et al., 2011). With this done, there is a great potential for organizations to generate value from the Big Data. McKinsey indicates that raised productivity will be followed by increased efficiency and improved quality of products. Therefore, industrial organizations have a lot to gain from the use of Big Data (Manyika et al., 2011). Brynjolfsson and Hitt's (1995) study shows that organizations that invest in redesigning their business processes when implementing an IT project have greater productivity and business performance, than the organizations that do not. This indicates on the value that can be created through lowered costs. Despite this, many organizations are still uncertain of how they are to use Big Data for internal improvements. It can be explained through the

traditional focus on customer interaction improvements, which has made Process Analytics come in second place.

Big Data and Process Analytics - the case of SKF Insight

In 2013, SKF (Svenska Kullager Fabriken) launched a revolutionizing application for their bearings (Ahlbom, 2013). Previously, technical solutions had been limited to only advise when the bearing already had broken down. However, with this technical innovation, they can now get continuous updates on how the bearing is "feeling" or the status of it due to the built in sensors and electronics. In this way, they can predict a bearing breakdown, inform the customer who in turn can take simple actions, such as adding lubricant or mitigating overloads, to avoid a major problem and stop in the production. In this way, the machinery becomes more reliable and less vulnerable to downtime (Parmar, Mackenzie, Cohn and Gann, 2014).

The innovation, named SKF Insight, consists of the information from the bearing being transferred via wireless technique, also built in the bearing; a communication that works even without Wi-Fi. The vision was an integrated sensor package with its own power supply, being able to communicate wirelessly if any of the bearing's critical parameters were deteriorated. In order to reach the vision, engineers have built the components smaller and developed a new capsule for sensors and electronics.

The newly installed sensors can measure many of the critical parameters within the bearing. These are rounds per minute (RPM), temperature, speed, vibration and load (Ahlbom, 2013). With the help of this innovation, the CEO of SKF is certain that their customers will experience better control over their machines' life cycles and lower total costs in combination with higher reliability and longer run time (Ahlbom, 2013).

One of the telecom companies uses Big Data to improve their Process Analytics. They have discovered the value of using it when deciding where to expand their grids. They spend great deals of resources on grid expansion and want to be certain that where it takes place, will result in the highest return. In their Process Analytics plan, they also take into account how to handle the maintenance of existing grids. Trebilcock (2013) describes it as organizations have moved from being reactive to being predictive regarding for example maintenance of equipment. With the help of Big Data, organizations do no longer need to wait for the equipment to break, instead they can have continuous updates on the different utilities through the generated data. In this way, organizations can identify a soon-to-be-broken utility

and take necessary actions to prevent the effects of such a break, e.g. by sending a new device to a customer whose soon is to break. This is something that one of the telecom companies has introduced. In addition, Big Data can facilitate in becoming prescriptive (LaValle et al., 2011) rather than just predictive. Instead of just saying that the price of a product should be increased, the right analysis can even tell an organization with how much they should raise the price. Big Data Analytics brings another level to performed analysis, it adds another dimension to issues and solutions. Therefore, it becomes a useful tool in order to improve decision-making.

McKinsey states that decisions have traditionally been made by HiPPOs (highest paid person's opinions) (Manyika et al., 2011). However, data-driven decision-making has been proven to be more beneficial (LaValle et al., 2011). This goes in line with one interviewed expert's definition of Big Data as something that should be used to improve decision-making through the use of different data sources in a smart way. With this said, the time of the right gut feeling might be passé. Moreover, top-performing organizations have been proven to follow data-driven decision-making to a far greater extent than low-performing organizations do (LaValle et al., 2011). Ergo, organizations that strive to make better motivated decisions should include Big Data into the decision-making process.

5.1.3 Customer Analytics

According to some of our interviewees, a Big Data solution has the greatest impact when it is applied to mining and analyzing user and customer data. It is also the most common application area amongst the interviewed companies. In our digital society, vast amounts of user and customer data are produced at all times. A Big Data solution offers efficient ways to capitalize on this data. One example is how Big Data was used within a large MNO (Mobile Network Operator) in Asia to improve targeted marketing. The Big Data solution improved the marketing by 13 times compared to the previous best practice (Sundsøy et al., 2014). Even though data mining is the first step, followed by analyzing data and getting new insights, it is not enough for an organization to create value. In order to create value, a company must be able to turn new insights into actions. A Big Data solution can show the right path but it cannot take the organization through it.

To create a powerful data lake, companies must collect relevant data from multiple sources, also including external sources. However, the empirical data of this study shows that some companies even fail in collecting data from their own channels. One of the interviewed banks created a digital channel and lost the customer insights since they did not use the new channel to collect customer data. "*It is common that businesses only converts their traditional business to a digital platform without adapting to, or capitalize on new opportunities*" according to a media company representative. This points to the importance of changing or adapting the

strategy to become more directed towards Big Data. According to us, successful companies value customer data differently than unsuccessful companies. A "knowledge-based view of the firm" is expressed by the Customer Knowledge Management (CKM) concept and is described as knowledge being the most strategically significant resource of the firm (Wilde, 2011).

So how can companies avoid missing out on valuable data? Rowley and Slack (2001) explain how Customer Analytics can be divided into four sub-categories; cognition, customization, cumulation and context. Cognition focuses on customer behavior and the knowledge is used to improve design and the infrastructure that the customer uses. Customization focuses on individual customers in order to develop customer profiles. Cumulation focuses on a general level at customer behavior to indicate market trends, which is used for strategic decisions. Context is the category for customer behavior in different channels, like a physical and digital marketplace. According to the principles of CKM, organizations should focus on filling all these categories with data in order to get a clear understanding of their customers (Rowley and Slack, 2001). Rowley and Slack (2001) recommend that companies try to answer the following questions to make sure they fill these categories with relevant data. Questions include:

- Who are our customers?
- Who and where are potential customers?
- What benefits do customers expect?
- What are customers' attitudes and behaviors?
- How can the strengths of customer relationships be measured?
- How can customer value and profitability be projected and enhanced?
- How can customers be grouped into segments to support market analysis and communication?
- Who will be our customers five years on? How will customer behavior change over the next five years?

In doing this, the digitalization of banks would never have been designed without a solution on how to capitalize on the generated data since the context category would have been left blank, leaving the compilation of the categories incomplete.

Big Data and Customer Analytics - the case of United Healthcare

As for many organizations throughout a number of industries, it has become more important with customer satisfaction, as the number of substitutes is increasing and loyalty to a specific brand is more uncommon among customers. United Healthcare, an American health insurance company, is no exception of this increased competition. They have been working with Big Data for a long time, but with focus on structured data. Due to the increased competition, they had had to add focus to unstructured data as well in order to better measure customer satisfaction. (Davenport & Dyché, 2013).

The unstructured data mostly consists of voices from people calling their call service. The voices are transferred into text, which can then be analyzed based on the words the callers choose. With the help of analytics, they can then determine the caller's attitude towards the health insurer. In this way, a dissatisfied caller can be identified and the United Healthcare representative can take action to turn the dissatisfaction into satisfaction, maybe by such a simple action as contacting the caller and find the origin of the problem. (Davenport & Dyché, 2013).

The approach presented by Rowley and Slack (2001) covers the principles of Customer Knowledge Management but, according to us, it does not cover the paradigm shift that Big Data brings, which is data for predictive and prescriptive analytics. The interviewed organizations had different approaches to Big Data. Some of them had a number of questions they wanted to find answers to; something Rowley's and Slack's approach is suitable for. Others had an innovative approach because they did not know what answers to find. CKM and Customer Relationship Management (CRM) at these companies focus on predicting the future and generating recommended actions through analytics. A popular term within the telecom industry is a *churn*, i.e. if a customer is about to leave the company. Big Data is used to predict when and how to approach customers in order to make them stay. A grocery retailer tries to understand when customers are mature to become e-customers and how to best approach them. These types of insights demand data from multiple sources and is not covered by Rowley's and Slack's approach as it demands the companies to be prepared for the unexpected and have a strategy for how to handle these insights. Big Data is described in the interviews as an offensive strategy used not to stay afloat but to improve their business relative to their competitors. It therefore makes sense to have an open mindset when approaching Big Data, ergo not having explicit questions, but rather be open to what insights the Big Data might generate. An inexperienced company should make sure to cover

Rowley's and Slack's categories but should aim to find new, unexpected insights to questions they did not know to ask.

Interviewees have reported difficulties in acquiring customer loyalty in a digital market. Wilde (2011) describes how CKM could involve customers into the knowledge exchange process to increase customer loyalty. Rowley (2002) exemplifies this and describes how user communities can be used on a digital market to achieve the same effect. A community is used for sharing knowledge from member-generated content. This makes these communities a great source for data mining. As mentioned above, mining is not enough. Companies must also be able to turn insights into actions. They need to be able to convert the findings they can make from the data into concrete steps on how they benefit from the data. Companies must listen to potential and existing customers' needs and work quickly to satisfy these needs. Companies therefore have to be flexible and react quickly to new influences. A bank representative describes that a company must choose a strategy that allows them to keep the product development loop as short as possible in order to stay competitive in a digital market. Wilde (2011) suggests that the management should promote self-organization within the company. When autonomous teams have access to enough information to determine task boundaries, product development will be quicker and the motivation amongst employees will rise. To install a technical solution so that all employees, partners and agents of the company have access to the right amount of information, is the creation of a knowledge pool (Wilde, 2011). A suggestion similar to the Big Data term data lake.

In conclusion, Big Data is a great tool to capitalize on customer data to find new insights. Companies should have an innovative and open mindset towards Big Data findings in order to reach the full potential of a Big Data solution. It is also important to actually act on the insights generated by the Big Data Analytics. In other words, have a fast product development loop in order to improve products and services according to market needs. A slow reaction to these customer insights can lead to loss of customers. Hence customer loyalty is lowered on a digital market when an organization reacts too slow regarding for example personalized customer offers.

5.1.4 Final thoughts on the application areas

As deducted from the empirical findings, both experts and companies agree that Big Data can be divided into two application areas in order to create value; one that focuses on internal processes and efficiency, Process Analytics, and one that focuses on Customer Analytics (see Figure 6). From this chapter, views like Porter's on strategy and Osterwalder's on Business Model Canvas also describe a business divided into similar areas. Are these findings enough to describe the division as correct? Are there other arguments for this division and why not three, or more,

areas? One reason can be that when dividing business into these areas, all parts of a business are taken into account. As of today, there is no need for a third area. Big Data is still young and, to a lot of people, a bit abstract. In time though, these two areas might be divided into smaller areas. This will follow as a result of the fields being explored further. The Big Data solution is something that is developed internally. Therefore, it is included within the internal barrier. The same argument goes for Process Analytics. However, the customer knowledge will be collected outside of the organization's borders and is therefore placed outside of the circle.

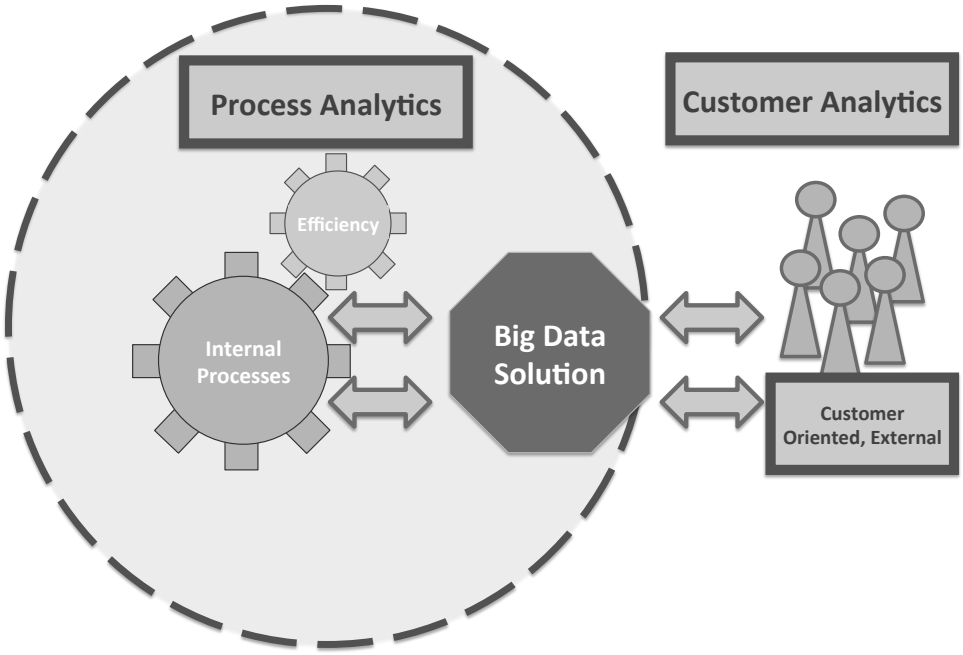


Figure 5 *Big Data Solution with two application areas. Illustration of how internal Process Analytics and external Customer Analytics relates to a Big Data solution*

Among the companies we interviewed, Customer Analytics was the most common application area. Why? Does it create more value than Process Analytics? Maybe. According to Porter's view on strategy, companies will in time be so efficient that the only way to gain competitive advantage is to have a well developed strategy; or great Customer Analytics. Further, the strategy and the level of customer knowledge are the things that differentiate organizations from each other, which can be one reason why it is most common for organization to focus on this application area. Another one is that it is this focus that generates revenues; the other is more focused on saving costs.

There might be other explanations as well to why the field of Customer Analytics is more common. One might be that the data is already existing and, in some way, available. Today, customers react on social media to make their opinions heard in one channel or another. Companies "simply" have to connect all data, which in many cases is available on either the internet or within the CRM software from when customers contact support. When studying data regarding Process Analytics, the data might not be available to the same extent.

Another explanation might be that companies have a strong belief that they know how to operate their business, but do not understand customers. A transformer for example do not follow weekly trends or seasonal behavior like customers do, it is just a physical device. For a company it might seem easier to understand how the transformer works compared to how customers behave. For companies that understand that the transformer also have unexpected behavior, and that can understand these behaviors, can save both time and money, which will result in the creation of a higher value.

A third explanation to why the fields are not equally common might be the result from the work of the pioneers within Big Data. Companies like Google and Facebook drive the development of Big Data and these companies focus a lot on customer and user knowledge. The development of Big Data specifically regarding Process Analytics might not get the same attention. This could be reflected on to other companies as well, like the ones we have interviewed, who are not pioneers to the same extent.

With this said, we are convinced that a company should look into both fields when implementing a Big Data solution, as this division is something that they might not have been aware of earlier.

5.2 Organizational structure

The empirical findings have shown that the organizational structure is important when implementing a Big Data solution. The findings have been divided into the categories of top management support, cross-functional teams and the supply of competence. According to LaValle et al. (2011), the biggest challenges in adopting analytics are of a managerial and cultural nature. This shows the importance of putting extra effort into these areas in order for the Big Data implementation to succeed.

5.2.1 Top management support

The organization around Big Data is of great importance if the results of it are to be successful. This is an insight from the findings of the interviews performed. Most of the interviewees emphasize the importance of having top management support

when conducting projects, in this case focused on Big Data. Young and Jordan (2008) and McDonough III (2000) state that top management support is the most critical success factor when it comes to project success. Further, they state that it is equally important in an IT project to consider the business side to it, as well as the technological aspects. Davenport (1998) continues by stating that there is real danger if the technologists are left to work on IT-projects that have a business aspect to it. In most cases, the technologists have limited knowledge about business implications. In order to overcome potential technical and business barriers, there needs to be an interaction between these functions and in that way get a fully covered view on an issue. This reasoning is also applicable for Big Data-projects. Furthermore, Davenport's article (1998) proves that keeping the IT department to itself and not fully integrating it into the organization is harmful to the outcome of the project. This implies the top management to include an IT representative in the management team. Also, Ifinedo (2008) states that top management support is one of the most positive influences on the success of newly diffusing IT systems. That the implementation of Big Data is relatively unknown to many organizations raises the importance of having top management support. The result from the study of Ifinedo (2008) shows that when top management support is high, the success level of the project is equivalent. Furthermore, the "*support, commitment, authority, and direction from top management for the software and for the various people affected by the system's acquisition is necessary in ensuring overall success with the software*" (Ifinedo, 2008:561). The empirical findings have come to the same insight: top management support is essential for the Big Data implementation to be successful.

One telecom interviewee says that the top management early on realized the importance of Big Data and the implementation of it in the organization. For them, it has been easy to prove the benefits, and from that, get the valuable support in continuing developing the Big Data handling. Furthermore, it was decided to implement this function on head office level within the organization. This is due to the insight that the data in itself is worthless; you need to create insights that lead to certain actions, leading to certain outcomes in form of the end goal. Moreover, an expert goes further than just getting the support from the top management, meaning that the Head of IT should be included in the management team in order to get the Big Data perspective on all issues. An expert concludes that the companies who have really succeeded with their implementation of Big Data, are the ones that have managed to implement a holistic perspective within the organization of the necessity of the change and on the digital transformation. The danger that is pointed to, is to view this change as something incremental and that the solution is to introduce an IT department, not connected to the other departments. An important note to make is that "*coming to terms with Big Data is prompting organizations to rethink their basic assumptions about the relationship between business and IT - and their respective roles*" (Davenport, Barth and Bean, 2012:24). This quote implies the great change a Big Data implementation can initiate. The traditional approach of

differentiating between business and IT is now obsolete; if becoming successful with the Big Data implementation, it is necessary to combine these two functions.

Top management support is important when discussing organizational changes. It seems to be the foundation to all changes within an organization, and without it - the change will be a failure (Jex and Britt, 2008). Based on the interviews with the experts and the organizations, it can be concluded that they agree on the importance of having top management support when carrying through a Big Data implementation. One reason for the support being important during an organizational change is that the implementation of Big Data is a change that will have an impact on the whole organization and in that way affect many employees in their daily work. If the top management does not prioritize a certain issue or project, then why should the employees do it? Moreover, the theoretical study has come to the same conclusion; in all types of organizational change, top management support is crucial if the change is to succeed and become permanent. However, a media company representative highlights one of the biggest challenges they are facing now in form of integrating the Big Data mindset in the whole organization, on all levels. Further, it is concluded that it is a different way of working as you take away power from certain roles when the focus shifts to more analysis. Something that people might find foreign and be hostile towards.

In conclusion, top management support is important in the field of Big Data as this phenomenon is hard to grasp. It is still very abstract to many, especially since there is no generally accepted definition. This puts pressure on the top management to convey the importance of why this organizational change is necessary. They need to create a sense of need among the employees in order for them to more openly embrace the Big Data implementation. Further, due to the abstract level of the subject, employees might prioritize other projects they are surer on how to handle and know what value that will be generated. In addition, as many employees will handle the data and the projects will be arranged in cross-functional teams, there is a need for a superior who supervises the work and makes sure that it is within reasonable limits.

5.2.2 Cross-functional teams

Ferdousi (2012) states that top management support is also important when introducing cross-functional teams. This composition of a team is further an important factor in the area of Big Data. In addition, Sethi, Smith and Park (2001) conclude that cross-functional teams have a positive effect on innovativeness, a feature that is needed especially in the beginning of the implementation process of Big Data. The majority of the interviewees bring up top management support and cross-functional teams as critical success factors in order for the Big Data handling to be successful. Despite the danger of defining individual activities as critical

success factors according to Porter and his article of *What is strategy* (1996), top management support and cross-functional teams are identified as important features in order to succeed with Big Data Analytics.

Further, one expert says that the point where most fail, is in the silo-way of thinking. In order for the Big Data implementation to work, you cannot only focus on your department and be closed towards others. Generally speaking, the empirical findings show that people do not think outside of their department, even though they can contribute a great deal to them as well. The example given is that people rarely understand how the marketing function can facilitate for the production function. This is one of the strengths when implementing Big Data; in order for it to work successfully, the silo-thinking needs to be reduced and unfamiliar departments needs to start to collaborate to a greater extent. Also LaValle et al. (2011) point to the benefits of integrating the Big Data-thinking throughout the whole organization. They mean that it is hard to gain the full benefit of analytics if each department has to discover and adopt new developments independently. However, a bank interviewee points to the challenge in eliminating the silo-thinking and making the collaboration between departments work in order to get a good solution in the longer perspective. In addition, one expert points to the difficulties of making this happen in reality. Departments tend to keep the data to themselves, and are restrictive towards sharing it with the rest of the organization. To some extent, it is the internal political atmosphere that hinders this development.

Hitt et al. (1999) conclude that top management support, together with political factors, is more critical for the success of a cross-functional team, than the internal characteristics of the team itself. This implies on the interconnectedness between the cultural aspects within an organization and how they can affect the outcome of a project. An interpretation of Hitt et al.'s conclusion is that all parts within an organization are dependent on each other. This goes in line with the discussion above about strategy and viewing all activities as a system rather than individual tasks. It will therefore not be enough if an organization is working in cross-functional teams; top management is equally important and necessary.

As pointed out above, the empirical findings and the academic findings match; they agree on the importance of working in cross-functional teams when handling Big Data. Further, as stated before, Big Data Analytics can give you the answers you did not know you wanted. The data lake opens up for a great number of insights and by being part of a cross-functional team, the insights will be looked upon from different angles. In addition, when collaborating among different departments, the silo thinking is reduced, which is a necessity in order to truly become successful with a Big Data implementation. Greater use of cross-functional teams leads to a state where Big Data can create synergies as it is avoided that the departments invent two solutions to one problem. In addition, a reduction of the silo thinking and an increase in collaboration between different departments, can be compared to the

principle of strategic fit; the cross-functional teams represent a bundle of activities put together. In this way, it becomes harder for competitors to steal data competent employees, as the strength of the team is not on an individual level.

To summarize, as the findings show that cross-functional teams are important, equally many have trouble in coordinating this type of team. We believe that cross-functional teams fail due an insufficient top management support. We have been told that it is much easier to fill a meeting room when the top management initiates the project, than if the project came from somewhere below. This indicates that if a cross-functional team is to function optimally, there needs to be a great deal of support. The project leader needs to feel the support from the top management. Moreover, another reason to the failure of cross-functional teams is the internal politics that take place within the organization. A hinder might be the deeply rooted culture within the organization. If the members of a cross-functional team have different agendas and incentives, the team loses its primary role of taking in other departments' inputs and knowledge. Most team members then lose the gain in collaborating.

5.2.3 Competence

In order to be successful with the Big Data handling, it is important for organizations to have the right IT competence. It is therefore necessary for most organizations to start searching for the specific Big Data competence to obtain. Some interviewees claim that the competence can be found in-house. Others say that they need to find this knowledge resource outside of the organization's borders. Regardless, one of the experts highlights the difficulty of finding the right competence, as the supply is limited of the people who knows the systems and has the right "mind", thus understanding both analytics and business. Further, it is explained that the older systems have other starting points than the newer ones, which makes the search for the right senior data scientists harder.

In this field within organizational structure, the experts and the organizations do not agree. The experts point to the importance of finding the right competence before starting the Big Data implementation. In contrast, the organizations believe that they have the necessary competence in order to begin the implementation of Big Data, and might only need to recruit in a later stage. This indicates that the organizations have not yet fully understood the principles of Big Data and the importance of having the right competence from the beginning. During one of the interviews, we were told that the solution to a project that was initiated three years ago, was outdated already when it was launched. This is something that might have been avoided if a data scientist or Big Data expert were inducted in the project from the beginning. By including data experts from the beginning, organizations increase their chance of making it right from the start.

Big Data and prescription - the case of the ice cream price

That the ice cream sales increase during a hot summer day is a no brainer, so the need for Big Data to predict that is non-existent. However, Big Data can help an ice cream seller to answer questions like what flavors to offer and which price to set to maximize revenues. Moreover, Big Data can facilitate in finding out how much the temperature needs to increase in order to trigger the ice cream desire among customers (Gupta, 2015). Big Data is therefore a powerful tool for fine-tuning and maximizing tactical decisions (Future Foundation, 2015).

In the case of prescription and Big Data, the need for knowing *why* is reduced; why the ice cream price should be increased. Within this field, it is rather about knowing *what*; what flavors to have, what price to sell to. These are the questions that Big Data can give you. (Future Foundation, 2015).

Many industries are aware of the difficulties of finding the right competence. But what is the "right" competence in Big Data Analytics? According to the academia and many of the interviewees, the right competence includes the IT knowledge as well as knowledge and insight about business making and organizational strategies. Sambamurthy, Bharadwaj and Grover (2003:243) conclude that a "*sustainable business value of IT emerges primarily through its complementarity and integration with business strategies, organizational design, structures and competencies*." This quotation further supports what has been said earlier about including the IT perspective on all questions. It also states that the IT department is no longer to be viewed as a sidetrack function; the IT is to influence all levels and all functions of an organization. Also, one expert agrees that the Big Data competence should understand the organization's strategies and act thereafter in order for the Big Data implementation to be successful. It is foremost important for the CDO to understand how the processes function today, but also how the organization wants them to function in the future. This is also valuable for the IT competence. Moreover, in regards of firm performance, the quality of IT capabilities are found to have a positive impact (Bharadwaj, 2000). This implies the great importance of including Big Data, and IT as a whole in the overall business thinking and in the organization's business strategy as it might affect the total success of the organization. It can be concluded that IT helps a firm establish a more sustainable competitive advantage when working innovatively (Swanson and Ramiller, 2004), as long as the resource is dynamic towards the ever-changing competitive landscape (Crawford, Leonard and Jones, 2011). Finally, the empirical findings and the academic findings agree that there is a great advantage if the data competence also has some knowledge in business.

To conclude, it is important for the Big Data implementation to have the right competence in place in order to get a successful outcome. If the right recruitment have been done and the CAO possesses both data expertise and insight in business, then it enables for the top management to understand and think in terms of Big Data when taking future decisions. Also, recruiting a number of data scientists enables a distribution of Big Data through the whole organization. In this way, the importance of Big Data will reach most parts of the organization.

5.2.4 Final words on organizational structure

To finalize the reasoning about organizational structure regarding a Big Data implementation, one can see that the topics that have been brought up (top management support, cross-functional teams and supply of competence) are all connected. They depend on one another in order for the structure of the organization to be successful when implementing Big Data. In order for cross-functional teams to be successful, top management support is essential and the right competence needs to be found within the team. In order for top management support to fully understand the opportunities with Big Data, the supply of the right competence is necessary. Moreover, the topics discussed are equally important in every change project, so it was no surprise that for example top management support was mentioned as a true success factor when implementing Big Data. With this said, an organizational structure as the one described above facilitates the implementation of Big Data.

Finally, the three topics within organizational structure are more of prerequisites. They themselves do not create or generate any actual value to the organization. However, they are needed in order to enable a successful Big Data implementation.

5.3 Big Data and ethics

The empirical findings conclude that organizations are careful about using too much of the data that they have access to. However, there is a fine balance between giving the customers what they want and violating personal integrity, a battle that many organizations deal with every day. Despite ethical guidelines being of great importance for most companies that handle Big Data, few revealed that they have pronounced ethics strategy. There are some points an organization needs to consider when handling Big Data from an ethical perspective. These will be explained further.

5.3.1 The balance between violation integrity and personalized offerings

As described above, there is a lot to gain from Big Data and Big Data mining. When trying to create an appealing product or service, it is necessary to know not only what is legal but also what is ethically right, and of course, what the customer

segment would appreciate. In the case of Big Data the ethical landscape is anything but clear and the line between perfection and disaster is blurred. A Big Data expert at a large grocery retailer concludes that similar organizations have an enormous power in understanding and interpreting people's behaviors. But further enhances that it is important to find the right balance between respecting the privacy and to personalize offerings.

Big Data and ethics - the case of Target

Target, the American retail store, has adopted artificial intelligence (AI) to understand changes in buying behavior amongst their customers (Duhigg, 2012). With that information they offer coupons to enhance the likelihood of the customer returning to the store.

The findings of Target have been well debated in the media. A girl in High School got targeted marketing regarding pregnancy (Hill, 2012). At this stage, her dad did not know she was pregnant. The baby commercials got her dad furious who went to the store and told the store manager about them. However, after some discussions at home, it was clear that Target had realized the daughter's pregnancy before anyone else. The father later confessed and apologized to the Target store manager. The change in the girl's buying behavior had triggered the marketing mails to include products typical of moms-to-be.

This story made Target realize that "*if we send someone a catalog and say 'Congratulations on your first child!' and they've never told us they're pregnant, that's going to make some people uncomfortable*", statistics and analytics expert Pole at Target reveals. Instead of sending only baby products in the targeted marketing, they include other random products in the ad as well. For example, a lawn mower next to the diapers, and wine glasses besides gruel (Duhigg, 2012). They argue that as long as the customer does not know that he or she is analyzed, the targeted marketing gets by. And they have become very successful regarding targeted marketing and directing coupons according to a customer's shopping behavior. "*Target alone, estimates that they have made over 1 billion dollars by being able to target which women are pregnant and which aren't.*" (Duhigg, 2012).

5.3.2 A new ethical approach

Because of this blurred landscape, in which Big Data exists, a number of reports address the need for new ethical guidelines and frameworks regarding the use of data and data mining (Larsson, 2013; Solomon and Bonham, 2013). Mingers and Walsham (2010) provide such a framework, called *Discourse ethics*. The theory, in

short, states that an action is good if all stakeholders agree on the specific terms. Or more specific:

"Only those norms can claim to be valid that meet (or could meet) with the approval of all affected in their capacity as participants in a practical discourse" (Habermas, Lenhardt and Weber Nicholsen, 1990:66).

The theory has two essential parts: (1) that the action must be agreed upon and approved by all those affected, and (2) that this must occur through a process of discourse. In our complex modern world, traditional theories on ethics, such as consequentialism, that an action should be judged by its consequences, and deontology, that an action should be judged by its intentions, have their limitations. In other words, the outcome of an action is usually difficult to predict and an action that is good for most people might exclude minorities (Mingers and Walsham, 2010). At the same time, the discourse principle does not give us all the answers, for example as to what a specific discourse process might look like.

As illustrated in the previous example, privacy is a central issue within this subject and it leads to some questions that the organization needs to consider; they need to develop their own guidelines and framework to work accordingly. The three questions, exemplified by a Big Data analyst at a telecom company, center what companies are allowed to do (juridical), what they can do (in terms of condition signed with customers) and lastly what the company itself wants to do (based on their own policies). The analyst continues by saying that it is up to each individual company how they want to navigate around these questions. As an organization is made up of people, it might be relatively straightforward to answer what an organization should do with the data. Another interviewee from the telecom industry says that "*as an analyst, I want to know everything and gather all data I can. But as an individual, I am much more restrictive*". The ethical question has turned into a moral dilemma.

5.3.3 Privacy concern and fear of power

In a sense, new laws and regulations force organizations to engage in some type of discourse. For example, since 2011, Swedish Internet based companies need the approval of a visitor to be allowed to store cookies (Riksdagen, 2011). At the same time, how can one engage in a discourse if one does not fully understand what it means to share data? Many users do not always understand how shared data can be linked and how it may affect their privacy (Agrawal et al., 2011). Location-based services are a good illustration: when users share their location, it is not directly linked to their identity and therefore not obvious how it could be a privacy concern. However, it has been shown that there is a close correlation between ones identity and movement pattern (Gonzalez, Hidalgo and Barabási, 2008). Data analytics can

associate a user with a specific residence or office to determine the user's identity. Private information like health issues or religious preferences can also be determined by tracking movements and patterns through hospitals and religious buildings. This usage of the data and the conclusions that can be drawn from it is for many users unknown.

Another issue that should be addressed is the public's fear of power. The vast amount of data mining and data sharing clearly elevates the potential for privacy violations (Bollier, 2010). So how can a company take part in these activities and still be viewed as trustworthy by the people? Esther Dyson, Chairman of EDventures Holdings, suggests that collected data should be transparent and accessible in a meaningful way and that individuals must be given the chance to get a copy of their record (Bollier, 2010). A further issue regarding the privacy right that has been debated for the last couple of years is "the right to be forgotten". The right should involve at least two parts: deletion of data in due time and the right to a clean state. Deletion of data in due time indicates that personal data should only be stored for a limited time. The right to a clean state suggests that negative and outdated information is not to be used against someone. By implementing these basic functions in the data mining, people should feel unrestrained in expressing themselves in the here and now, knowing that their actions are not going to haunt them for the rest of their lives. It would also give some of the power and control back to the individuals and thereby giving them reasons to trust Big Data mining. (Koops, 2011).

5.3.4 Big Data and integrity - a contradiction?

People generally have little idea regarding what impact the data they have authorized companies to collect will have in the future. Richards and King (2014) even argue that people have little idea of what kind of data that is collected and foremost how it is used today. This is also confirmed by one of the experts, which exemplified with a company that wanted to install wireless internet in a public place, an act that was much appreciated by users. What the customers probably did not know was that the devices that used the Wi-Fi were surveilled by the company, and the data they generated was collected. In conclusion, the customers do generally not know what the collected data will be used for, and probably not even sure what data they generate.

Integrity has been a popular word as many organizations collect more and more data about their users. For example, when ICA, a large Swedish grocery chain started sending targeted ads to its customers based on their previous buys, people became very angry and protested against both the collection and use of personal data (Andersson, 2009). However, once people realized the benefits of targeted ads, they appreciated it and started taking it for granted. Based on this example, one can

conclude that a reaction to a "violation of integrity" is soon overcome by the people who use the services if they find it valuable, regardless of what type of data it generates to the host organization. A data analyst at a large media company made the comparison that people expect organizations to know when they move, and automatically make all the necessary changes that come with a change of address. However, people are restrictive about their integrity and do not wish to share everything with different organizations. An equation that is difficult to solve. It further leads to a contradiction and an aggregation of finding the balance of customer satisfaction and not intruding on individual's privacy. Moreover, many customers today get frustrated if they get offerings that are not applicable to their life situation; a person living in a single household has limited use of big pack offerings for example. The consumers today are picky and expect personalized offerings. "*They want to be greeted based on their situation, anywhere, anytime*" says an interviewee within the grocery retail industry. But once again - it is important that the individual's privacy is respected. The key, as the Big Data analyst at a grocery retailer concludes, is to make the customer feel respected at all times and as long as the offerings are relevant for the individual, quite many can be done. However, there are difficulties of applying this in reality.

With the shown examples, it is easy to agree with the statement that "*people are irrational*". One expert describes that as long as a customer understands the benefits of the data collection, they have a much more positive attitude towards sharing data generated by themselves. One expert continues: "*if the customers see that they get a useful service bag, which improves their lives or their everyday routine, this is something where the people become much more open*". One example of when customers are susceptible to share their most personal information is the case of Tink. It is an app that sorts and arranges your bank transactions. This organization has access to an extremely large amount of an individual's personal data. The app is very successful which indicates that people are willing to share much of their personal information as long as it facilitates their everyday life.

5.3.5 Legal requirements

"*Of course [the laws and regulations] set some limitations*" says a data analyst at a media company. The legal requirements are established to protect the integrity of the individual (Directive 95/46/EC, 2003). It further brings us back to the question of what organizations are allowed to do regarding their collection of data. One expert identified ethics in relation to Big Data as one of the major barriers to its development. Further meaning that most organizations are too afraid of looking into what they can do, rather than what is legal. This indicates that firms limit themselves to their existing structure rather than to the limit of what they are allowed to do. However, interviewees have indicated that if you are large enough on

the market, you have some influence over the legal requirements, and can at the least have an impact on the direction of the legal development.

5.3.6 Big Data, ethics and the future

There are many regulations regarding what an organization is allowed to use the data for. An E.ON Elnät employee believes that in general, they can only use it for the purposes that are stated in the user agreement. Further, it is believed that the regulations will be stricter and indicated that a new EU-regulation regarding data and integrity protection is soon to be launched, with the aim of further protecting the customer.

Another important concern to take into account is the question about who owns the data - is it the consumer who generates it? The organization that collects it? An interviewee from an IT company focused within the automotive industry has taken a clear stand towards this question: the consumer is the owner of the data, and they will not use the data in such a way that it can be used against the consumer. Further, it is pointed out that it is an interesting discussion without a clear right or wrong. Moreover, much of the analysis can be useful for the consumer, however, it can also have the reverse effect. There is also an ethical dilemma about what information to share with other organizations. For example, in England, car manufacturers collaborate with insurance companies who adjust the risk premium according to driving habits and behaviors. Another question car manufacturers deal with is how to handle the data generated from a vehicle if the police ask for it. The data might then be used against the customer, but hopefully for a good cause. Companies in other industries are also battling this type of questions today.

In the end, companies want to give the users a certain profile, in order to give them better and more customized services, according to an E.ON Elnät interviewee. It is continued by saying that in order for organizations to be proactive towards their customer base, they need access to certain levels of Big Data. This will result in a better care of the customer segment.

5.3.7 Final thoughts on ethics and Big Data

From the empirical findings we see that many companies fear ethical missteps. At almost every company, the ethical aspect of Big Data is a common topic and is seen as an issue. Experts agree and say that it is a common barrier for companies. Only a few companies revealed an ethics strategy during the interviews. At the same time, the principles of ethics and moral is a rooted field and there are a number of publications who treat this relatively new issue that Big Data brings. So why do companies still struggle to overcome this fear of ethical missteps? A bank representative reveals that they do not use their Big Data insights to their full potential, because if they did, they are afraid that they would scare away customers.

Is it this mindset amongst employees that slows down the progress of Big Data solutions?

If we were to compare different ethical dilemmas, however difficult, the misuse of data is an example where the customer, or user, gets directly affected by the actions of the company. Compare this to if it was revealed that a company used child labor. Some customers might pull away because of the violation of human rights, but none of the customers are personally affected by the actions of the company. This argument motivates organizations' caution towards using all the collected data. The reason that they might lose customers if they regarded the collection of data as a violation of privacy becomes more viable.

Another possible reason to why companies find this privacy concern so difficult to solve might be because there is no definitive answer to what is right or wrong. This could make it difficult to find a solution that fits all the customers. Although, our belief is that companies could solve this by developing a well founded ethics strategy before launching a Big Data solution. This should at least involve a plan to delete outdated data and to make sure that other organizations with a different agenda cannot get their hands on the data, as can be seen in the examples of Brazil and Russia where governments have gotten access to data generated by companies. The strategy should also give freedom to individual customer in ways so that they can view what data a company has on them. Data mining should have the purpose to create value and never be used against customers. This strategy should also be communicated to customers and to employees so that both users and developers feel comfortable with the mining and usage of data. As mentioned by experts during the interviews, customers tend to be comfortable to share data when they realize the value they get in return. Also, employees might start daring to use the data more optimally if they have a policy to relate to.

The last point to make is that people in the beginning tend to be quite restrictive about approving organizations to collect data about themselves. However, this is a feeling that tends to decrease as there is an increased insight about the value the data collection creates for the customer. As pointed out before, the individual tends to be inconsistent in the approach towards personal data collection. The companies' fear of mistake in this field is therefore legit. Finding the right balance is a real challenge that organizations need to consider. We believe that an ethics strategy can help companies to find the balance, and in that way create higher value for their customers. In the future, finding the right balance might be even easier. According to a bank representative, young people find it easier to share personal data compared to an older generation. We think this is a result of growing up in a digital era and that people in time will have more confidence in companies to handle their personal data because they see the value of the services provided. As Porter concludes on strategy - it is about choosing what not to do and come to the conclusion that one

cannot please everyone. The ethics strategy will therefore become a way to differentiate a business from others.

Finally, personalized offerings will most likely increase the sales as the customer will be exposed to the products that he or she is most likely to buy. Also, a better adjusted service according to personal preferences will create a higher level of customer loyalty. Moreover, as the customers will feel more secure with organizations that have developed an ethics strategy, it will avoid churns and possibly also attract a greater number of customers. These reasons will lead to increased revenues thanks to Customer Analytics, or at least constant revenue streams, i.e. they are ways for organizations to create value.

6 The case of E.ON Elnät

This chapter discusses the findings from previous chapters applied to the case of E.ON Elnät. The purpose of this chapter is to guide E.ON Elnät more concretely on how they should continue their work with the implementation of Big Data into their organization.

6.1 E.ON Elnät and Big Data today

E.ON Elnät has been working with data for a long time and has collected vast amounts of data. Consequently, they have existing processes for how to handle the data. Also, steps have been taken towards a Big Data implementation. For example, E.ON Elnät recently employed a data scientist to work with the processes of Meter Data Management. Further, they have employed a data expert who develops their local data warehouse. Based on this, and on the empirical findings, it is evident that E.ON Elnät has taken a good first step towards a successful Big Data implementation.

E.ON Elnät has recently updated their data warehouse in a local data warehouse project. The structure and architecture is stunningly similar to that of a Big Data solution. They are now creating a data lake with great accessibility for different departments. Accessibility to the data lake is mentioned as an important cornerstone within Big Data since the data should be used and understood by cross-functional teams, not only by data experts or special departments. E.ON Elnät has chosen database software that goes well with time series analysis, which is of essence for E.ON Elnät since their goal is to mine data from the grid in a high frequency. Unfortunately, the overall architecture does not support that kind of mining, hence E.ON Elnät will have to extend their warehouse to include this. The reason is that when this project was initiated, the architectures did not see the need of a system that could scale to the necessary extent today. We recommend E.ON Elnät, in accordance with interviews with Big Data experts, to construct their warehouse to be as flexible and scalable as possible. Today's system might be able to handle a certain number of objects, measuring points and sample frequency, however, in a couple of years the need for bigger volumes might increase more than we can imagine today. By building a scalable system, they avoid finding themselves with an outdated warehouse within a few years.

Below we present our recommendations for E.ON Elnät based on our findings. First, a review of the necessary organizational changes is presented. The changes consist of three prerequisites that need to be in place for a Big Data implementation to be successful. Then, in line with how other companies often present a proof of concept,

Big Data solutions to the three use cases described in the second chapter are illustrated and discussed.

6.2 Changes in E.ON Elnät's organizational and working structure

In order for E.ON Elnät to succeed in their Big Data implementation, there are some changes that can be done regarding the organizational structure. This recommendation is based on the insights provided by the organizations and experts interviewed regarding their experience of implementing Big Data. It is further based on interviews with employees within E.ON Elnät to make the recommendation fit the existing structure to some extent. Also, the recommendation is supported by the secondary sources.

6.2.1 Top management support

As pointed out before, top management support is essential for successfully implementing Big Data Analytics into the existing business. Many organizations have realized the need for Big Data Analytics, but are still hesitant as they are not sure of how to pursue it. However, it has been proven that the first, and very necessary step, for top management is to show interest and encourage this type of analytics. A data expert at E.ON Elnät believes that employees on a lower level understood the need and necessity of Big Data earlier than top management came to the same insight. However, today, they have initiated a strategy project, including a group of data analysts. It is a good example showing that the top management has interest in developing its data handling, however, there are still many improvements that can be done. In order for Big Data Analytics to spread throughout the whole organization, the number of this type of projects needs to be higher. Based on this, the management of E.ON Elnät should look further into the world of Big Data and encourage the employees to develop programs and processes around Big Data.

In addition, we recommend E.ON Elnät to create the position of a Chief Analytics Officer, CAO or Chief Data Officer, CDO. This person will act as a leader for the data analysts and be a part of the top management. In this way, a Big Data perspective will be included in all the issues discussed, and affect the overall direction of the organization. Also, by including a data expert in the management team shows how much the organization is willing to invest in data handling and analysis.

Further, an E.ON Elnät representative reflects on some strategy projects. The initiation by and support from top management, facilitated when calling to meetings between different departments. Based on this, we believe that the top management should introduce more incentives for the creation of cross-functional teams as it has been proven to be a winning concept.

6.2.2 Cross-functional teams

The empirical and theoretical findings agree on the point of cross-functional teams. In order for the Big Data implementation to get full impact within the organization, the silo-thinking and working within its own function need to be changed into close collaboration between the units where information and data is easily shared and the organization's different competences are used.

Creating cross-functional teams can be done in different ways. An interviewee within an IT company in the automotive industry describes that in every project that is initiated, a data scientist and a data architect are present. In this way, the company can get a Big Data perspective within every project. This working process is something that we think would fit E.ON Elnät. In a recent strategy project within E.ON Elnät, a group of employees from different departments were chosen as part of a support team. Noticeable is that one of these groups consisted of a data scientist and a data architect. Constructing cross-functional teams in this way, with support teams consisting of experts from different departments, is already something that has been introduced within E.ON Elnät. Our recommendation is therefore to continue and improve the function of cross-functional teams through initiating more project groups consisting of members from different departments.

The support team, consisting of experienced employees from every department within E.ON Elnät should be called to initial project meetings. Their goal should be to create synergy between the departments by providing insights from respective department and knowledge from respective expert field. The size of the team and number of members should fit the number of new projects initiated within the organization. The support team is further important in strategy and innovation projects where the final goal might be fuzzy and the solution might benefit more than just one department and unit.

The team members will have regular day-to-day duties within individual departments as well. Therefore, team members need incentives to prioritize these projects before the regular work. Project leaders also need mandate to call members of this team to meetings. Both of these changes need to come from top management.

6.2.3 Competence

With Big Data being a great tool for E.ON Elnät, and the data lake being available for all departments, the company should want to increase the general understanding and knowledge in how to work with Big Data. E.ON Elnät would benefit from having a greater number of employees that can find necessary data and use it on a basic level.

If data is going to be used by more employees within E.ON Elnät, they need to improve their competence at many levels; from creating standard reports, which is a relatively low level of data competence, to extracting insights from the data, which is a high level of data competence. We highly recommend E.ON Elnät to not underestimate the need for great competence and how difficult it could be to find. As mentioned earlier, high level of data competence and experience is hard to find since the field of Big Data is young and at the same time growing. This type of data competence is essential to reach the full potential of Big Data solutions. A way to increase the data competence among already existing employees is to educate them within the field. It is not about educating people to become data specialists, but rather to make a greater number of people knowing basics about data and how to handle it. In this way, E.ON Elnät can gain the lower level of necessary competence and make sure that the knowledge and potential of Big Data is implemented in every project and team.

As of today, E.ON Elnät has two people working with data analytics and data warehouse architecture. The existing competence within the organization is sufficient for today, but in order to benefit as much as possible from the Big Data implementation, an expansion of data scientists is highly recommended. For example, in order to create a support team including data scientists, as mentioned above, E.ON Elnät needs more employees with that kind of competence. We therefore suggest E.ON Elnät to start a search for more data scientists and experienced Big Data project leaders now. These individuals are good to have onboard now and are essential to have in the future. Recruiting more data scientists will also be a good way to get new perspectives on the business and the data handling; someone who does not know E.ON Elnät from before will hopefully present a different angle than someone who have been working with data within the organization for a longer time.

The last point we want to make regarding data competence within E.ON Elnät is the use of partnerships. As could be read about the IT company and their collaboration with a university, we urge E.ON Elnät to extend the partnerships with for example the close by universities. Through such collaboration, E.ON Elnät will definitely get new perspectives into the organization, without having to make huge investments.

6.2.4 Ethics

E.ON have on a global level encountered issues with the kind of data mining that they are now aiming for in Sweden. In the Netherlands, the population demonstrated against hourly data mining from households, arguing that it was a violation of privacy as you can map an individual's habits and life situation based on the energy consumption. Even if the general view of privacy violation in Sweden differs from the Netherlands, we still encourage E.ON Elnät to have a dedicated

strategy on ethics before launching their Big Data solution. The strategy should be communicated to the customers and at least involve:

1. The right to be forgotten
2. The right as a customer to view the data E.ON Elnät has on you
3. That negative data is never to be used against the customer
4. Communicate the ethics strategy through the principles of discourse on how the data will be used

E.ON Elnät should also communicate the reason they are investing in this Big Data solution and how it benefits their customers. As mentioned by some interviewees, customers usually accept to share data if they see what value they get in return. With a well-developed and well-communicated strategy on ethics, E.ON Elnät can avoid the people's fear of power and surveillance and instead be viewed as a good and modern technology company. As mentioned during the interviews, it is seldom customers' view on privacy, but rather the employees' fear of scaring customers that prevents the company from developing new products or services. With a well-communicated strategy, this obstacle can be avoided, as the employees will have the strategy to rely on and not doubt whether a project would be correct from an ethical point of view.

6.3 Use Case 1 - Sensors to predict weird behaviors and failure

Many of E.ON Elnät's transformers in the main grid date back to just after the Second World War. These were expected to last for 40-50 years. Many have lasted for longer than expected, however, it means that E.ON Elnät now have a lot of expensive and important equipment that are closing in on retirement. In time, all of these transformers will break down and E.ON Elnät will have to pay billions of euros to replace them. E.ON Elnät needs to replace these transformers successively. To spread this cost over a long period of time, E.ON Elnät wants to start replacing the ones that are most likely to break down first and keep the ones that will work for a bit longer.

There are two types of failures to these transformers. One that is due to sudden breakdowns, because of misuse and failure in primal parts, and one that is slower and due to wear and aging of the components. There are a number of factors to be measured on these transformers: oil temperature, water levels, load on the grid, some 30 different gases, water levels among others. Today, it is still unclear which factors that could be measured to predict a failure. To collect data from all these factors, from all 1100 transformers, in real time, would be an almost impossible challenge for any Big Data solution we know of today. Fortunately, not all of these needs to be measured in a high frequency. Failure due to wear and aging is a slow process so these factors could be collected more seldom. Instead, E.ON Elnät should

focus on mining other factors on a higher frequency, like oil temperatures and water levels. This data should be analyzed together with types of data that E.ON Elnät already have, like the load on the grid. To combine different sources like these, a Big Data solution could be used to help E.ON Elnät to decide which transformers to replace and when to replace them.

This technique is already used by a telecom company who sells access to Digital Television through a Digital Television Reception Box. By collecting data from these boxes, they can predict a failure and send the customer a new box before the first one has broken down. This proactive behavior saves time and money and at the same time creates customer loyalty (Also see the SKF case).

6.4 Use Case 2 - Understanding feeder endurance and grid capacity

When transporting electric power through feeders, heat is generated. When these feeders are heated, they more easily stretch. The gravitational pull on an overheated feeder could cause residual damage. If the feeder is stretched too far, it will not go back to its original size when it is cooled down. Before that, it is more common that the feeder reaches ground level. There are safety levels on how close a feeder can be to the ground; if it were to touch a truck or the ground, the result would be devastating. Therefore, it is important for E.ON Elnät to always make sure that no part of the feeder, which could be miles long, is ever overheated. If it were to get too hot the grid takes damage and could break. This would result in a loss of income and cost to repair the broken parts of the grid.

The amount of energy transmitted, the outside temperature, external weight and wind levels will together determine the temperature and stretch of the feeder. The model and dimension of the feeder will affect its sensitivity to these factors. During winter, when it is cold outside, the feeders get a natural cooling and can therefore endure higher energy transmission. E.ON Elnät's electric grid system is huge and to measure all these factors like stretch, feeder temperature, outside temperature, external weight (snow, ice, birds) and wind levels would produce enormous amounts of data. It is measured in small scale at a few places in Sweden. At other places E.ON Elnät predicts and guesses the stretch at certain times. This results in a number of extra safety measures, resulting in them building grids that probably have much higher capacity than it actually has to endure. If E.ON Elnät were to gain exact knowledge of the endurance and capacity of their grid it would improve their decision-making when expanding or improving the grid. E.ON Elnät spends millions of euros each year to improve the grid and this information is of great value.

Big Data Analytics is the perfect solution when having to mine and analyze huge streams of data like these, but that is not the only problem that could be solved by a Big Data implementation. Up until now, data regarding the capacity has been

collected in different databases within different units of the organization as a result of the units' autonomy. This has resulted in that the same components within the grid have different labels in each database. A Big Data solution proposes one common database and with this design this problem would have been avoided.

6.5 Use case 3 - Decision-making when building new sites

E.ON Elnät has two types of customers; producers and consumers. E.ON Elnät is always looking to achieve a balance between these two. E.ON Elnät would prefer that a producer connected to the grid where consumption is high rather than low. In the same way they would like a big consumer to connect where production is much higher than consumption. In order to map these users together, E.ON Elnät needs to know both the capacity of the grid as well as how it is used. This information affects the pricing if a power plant would like to connect to the grid. Today, a producer of wind power would first analyze the wind capacity at a given place, and then ask E.ON Elnät what it would cost to connect to the grid at that point. It can take E.ON Elnät up to three months to answer the question. If they knew the exact capacity of the grid at all times, they could instead create a map that shows the price to connect at every point, depending on the capacity and usage at that area. This would help producers and would also give large consumers a hint on where it would be profitable to build a factory. This would save both E.ON Elnät and their customers' time and money, as it is a solution that both lowers costs and creates value.

Every year, E.ON Elnät spends millions of euros on projects to extend the grid. Exactly knowing where the grid is at low or high capacity is essential to make good decisions on where to place investments. Another question that is relevant is; where are the most valuable customers? What do our customers need? What are the trends on the market? An example of a trend is data centers, an industry that is growing rapidly. Large media companies need a grid with high capacity at the same time as they are looking for a cool environment since servers need cooling. Installing a data center in northern Sweden would be beneficial for these customers. It would be useful for E.ON Elnät when deciding on where to extend the grid if they get access to these demands and trends.

7 Conclusion

This chapter summarizes our findings from the study. Here we also answer our research question and purpose, and clarify our contributions, both from an empirical and theoretical standpoint. Lastly, we list our recommendations to E.ON Elnät.

From this study, we have explored that organizations can create value from Big Data Analytics in the way that they apply their solution to focus on both or either Process Analytics or Customer Analytics, together with an ethics strategy, given that they have a certain organizational structure (See Figure 7). These findings summarize the first steps companies need to take in order to create value from Big Data. Further, the findings are divided into either prerequisites or value creators. Organizational structure containing three subcategories (top management support, cross-functional teams and supply of competence) are viewed as prerequisites; functions that need to be in place for a Big Data solution to succeed, but does not in itself create value from Big Data. The two application areas, Process Analytics and Customer Analytics, together with an ethics strategy are considered to be value creators as they can either generate higher revenues or saving costs. In addition, Big Data is one way to move the needle and to create competitive advantage, however, in some industries, it might soon be a prerequisite in order to be viewed as a competitor.

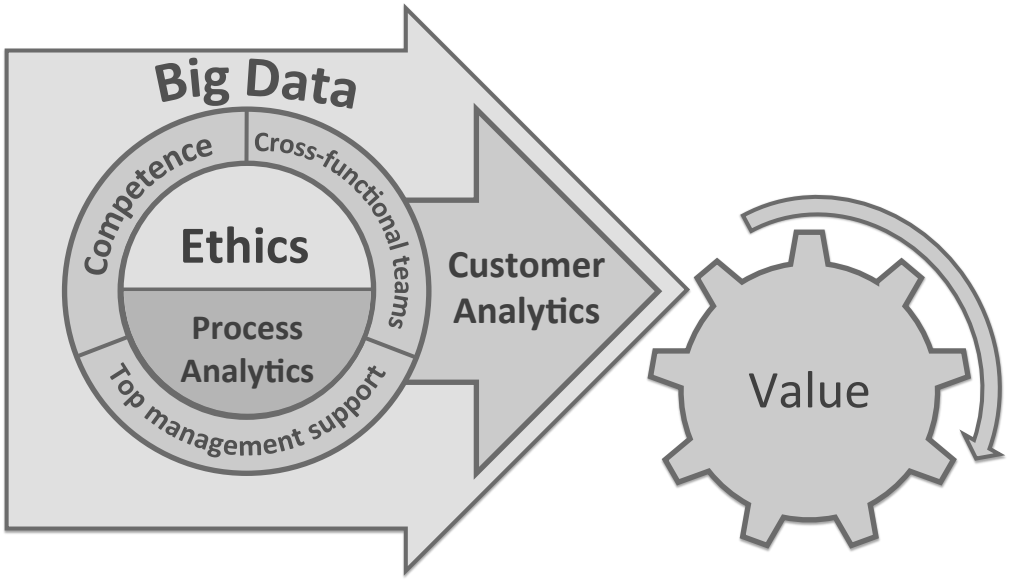


Figure 6 *The components of a value creating Big Data solution*

From interviews and observations on E.ON Elnät, we conclude a number of practical problems E.ON Elnät wanted to solve. From the empirical and theoretical findings we have been able to present Big Data solutions and recommendations for how E.ON Elnät can solve these problems (see chapter 6).

Organizations that are about to implement a Big Data solution should emphasis on getting the right competence and creating an ethics strategy. These seem to be the themes companies struggle the most with. From an empirical standpoint, this is our greatest contribution. From a theoretical standpoint, we contribute with guidance in the field of Big Data by dividing it into the application areas and clarify how they differ and can create value for an organization. In this way, the world of Big Data is easier to overview as one more obvious can see where it benefits the organization. Moreover, our theoretical contribution also lies in the correlations between foremost the features within organizational structure, i.e. how they influence each other.

From interviews and observations on E.ON Elnät, we have identified practical problems that can be solved with the help of Big Data Analytics. From the empirical and theoretical findings we have been able to present Big Data solutions and recommendations for how E.ON Elnät can handle these problems.

The most important findings that E.ON Elnät should consider during their Big Data Analytics in regards to the practical problems are:

- Nominate a Chief Data Officer
- Get visible top management support for all Big Data projects
- Introduce incentives for team members to prioritize cross-functional projects
- Recruit data scientists and data architects
- Develop new use cases to increase motivation and understanding for the Big Data initiative
- Educate employees in the basics of Data Analytics
- Build a scalable data warehouse
- Include data scientists and architects in every new project
- Extension of partnerships with for example Lund University
- Develop an ethics strategy containing:
    - The right to be forgotten as mentioned in chapter 5.3
    - The right as a customer to view the data E.ON Elnät has on you
    - That negative data is never to be used against the customer
    - Communicate the ethics strategy through the principles of discourse on how the data will be used

8 Discussion

This chapter discusses and questions our results and conclusions based on the research. The discussion covers what could have been done better and what factors affected us in our work.

8.1 Interpretation of results

So, what does the result mean? Based on the findings regarding organizational structure, the Big Data implementation is the typical organizational change, where top management support, cross-functional teams and the supply of competence are three essential parts in order for the change to be successful. The three parts are prerequisites in order for the actual data solution to create value for the organization. A company that invests in a Big Data solution should be aware of this and therefore also focus on the necessary organizational structure that needs to be in place for the implementation to be successful.

Our conclusion regarding Customer Analytics and Process Analytics goes hand in hand with Porter's view on strategy and Osterwalder's Business Model Canvas. These two frameworks could be used to conclude that Big Data Analytics is the way to go in order to create a competitive advantage or to create value. But none of these approaches focus on necessary enablers to get there. Our result does not only show that Big Data Analytics could be a part of a value creating strategy, but also explains what is needed to get there. And since there are a great amount of academic research on top management support and cross-functional teams, organizations should feel fairly secure when including this in the organizational structure. Much research has also been done on the supply of competence, however, due to the novelty and to the specialization of competence within the Big Data Analytics field, organizations probably meet a great challenge within this area.

Our empirical findings on ethics are more puzzling to interpret. Despite that organizations have a good intention with the data collection, customers are hesitant in giving away personal information. This makes the organizations careful to use their Big Data solution at full capacity in order to not scare away customers. Therefore, we believe that this field is relatively immature and undeveloped. If both parties understood Big Data and the possibilities, our belief is that the fear of data collection would be expressed differently. As of today, fear is expressed by customers through avoidance of the company, and organizations' fear to lose customers. If both parties knew more about Big Data, the fear might be handled by the creation of a third party that could act as a controller of the collection and usage of the data. This example is similar to how it works with ecological products and

other environmental controls. If the collection and the usage of the data were given a passing grade, the customer would be able to find a label providing this information. In this way, both the employees and the customers would feel secure and safe with organizations' Big Data Analytics.

Finally, we have found that Big Data Analytics can act as a value creator. The technology is accessible, and under constant development. The remaining question is how well organizations are able to assimilate to it and how well they can refine their insights. We believe that it is Big Data that sets the limits, and it all depends on how well an organization can use it.

8.2 Big Data as a value creator

The aim of this study has been to explore if a Big Data implementation actually creates any value for the organization, something the study indicates. Based on the reasoning that the field of Big Data constantly develops, we believe that it is of utmost importance to take the first step towards Big Data Analytics and the implementation of it as an organization. Due to the discussion about AI and machine learning from the introduction, it is important to get on the Big Data-train, if an organization wishes to stay competitive. As of today, implementing Big Data Analytics still gives a sort of a first mover advantage; organizations implementing it are still considered to move the needle. However, in due time, Big Data Analytics will most likely become a prerequisite in order to enter any market and be viewed as a competitor. By taking the first step towards creating value from Big Data, i.e. implementing what has been written in this study, organizations will be able to last longer on the market, and the chances are increasing that they will be able to take the next step as well.

Moreover, as has been concluded from the empirical findings, data driven decision-making should get more space within an organization, and more people should dare to trust the results from data analysis, instead of the ever so reliable source - gut feeling. During the analysis, we were careful when expressing ourselves in regards to a manager's decision-making. As of today, managers are still needed and the data driven decision-making cannot (fully) replace the role of a manager. However, based on what was said in the introduction about AI taking over and the fast development of machine learning, we cannot help but to wonder if human interaction will be needed in the future regarding decision-making. Will machine learning come to the point where it replaces the human mind? In some sense, Arthur Samuel managed to build a computer that was better than him in chess, so what says that this cannot happen? The Technological Singularity might be closer to reality than first thought.

8.3 Big Data as a value creator?

We have asked ourselves the question if a Big Data implementation can create value for an organization, and found proof that it can. Big Data Analytics can result in better decision-making and more personalized offerings to customers, among others. But these are insights that a consultant can help an organization with. There are numerous ways in which an organization can create value, so why should they focus on Big Data specifically? What additional value does Big Data give, that other resources do not? Well, we believe that Big Data Analytics will lead to something great, to solutions that consultants today cannot offer. It will lead to something that we cannot even imagine today. The only limit to Big Data Analytics is how well organizations adjust to the technology. Big Data should not be seen as a quick fix, but it should be seen as a long-term investment.

8.4 The value of data

The study is discussing the value of Big Data and how organizations can do in order to create value from their handling of Big Data. In this sense, create value aims at the economical value that can be generated by the organizations. However, how does one calculate the value in absolute terms? How, and can, the value of data really be measured? This is a question that a data expert within E.ON Elnät has asked. In order to try to quantify the data somewhat, one can ask oneself how high the cost would be if the data had to be collected again. If the collected data were a basis for the next investment, how much would it be worth? Or how much savings can be done based on the data? This is one way to get an estimation of how much the data actually is worth to an organization. By thinking in this way, the importance of the data might be increased within an organization.

If controllers were to include the data as an immaterial resource in the accounting, it would have taken a clear stance on Big Data and Big Data Analytics. It would send an important message to the whole organization, that it is ready to invest in Big Data and that it values it greatly. The E.ON Elnät data expert compares data to real estate. Imagine if the data instead had consisted of real estate, it is most likely that the organization had hired a janitor to look after the place. However, when it comes to data, no one is really taking care of it in the way it should be treated, in relation to the value of it. It is therefore important that the management applies a more holistic perspective in order to see the full potential of the data. The Big Data paradigm shift also includes an organization's view on data; data needs to be looked upon as opportunities and possibilities rather than just a cost.

8.5 The effect on the result due to our method

We believe that our choice of method has affected our results. Our interviewees were representing Swedish or Nordic corporations and it was mentioned by some that the US have come further than Europe in terms of Big Data. Therefore, we believe that our results would differ if US corporations had been interviewed as well. This, since they have come further in regards to Big Data and therefore probably deal with other challenges than the European organizations do today.

According to us, Sweden and Swedes value privacy and personal integrity to a great extent, which has shown to create challenges for organizations regarding ethics and personal data collection. If the study had focused on companies from a country where large corporations do not value these factors, the ethical issues would probably not have been a matter. If the study were done based on interviews with companies in the Netherlands, where personal integrity has been shown to be valued even higher, the ethical issue would probably have taken on greater proportions than in Sweden.

8.6 Possible limitations and weaknesses of the study

Our organizational representatives were often in charge of the Big Data initiative and were often at a top management position. We therefore question if the result would have been different if we also had interviewed someone within the project group. From a top management point of view, top management might be very important, but from within the cross-functional teams, perhaps other insights would have been found. Interviewed consultants usually had a close relationship with top management and if they did not stay around long enough, they could have missed what was going on at a lower level later in the process.

Another possible limitation is that our interviewees made sure not to reveal too many details regarding their insights and how they have overcome their challenges. They probably see their lead in Big Data compared to other companies as a competitive advantage. Also, some interviewees pointed out that they would not reveal specific details regarding their Big Data implementation. This might have affected the result of the interview. Due to this and that limited research has been done within the field, we believe that these two reasons explain the challenge in finding more concrete and practical conclusions.

8.7 Suggestions for further research

As many interviewees have said, and what also can be found within the academia, the definition of Big Data is fuzzy. We believe that by categorizing the field of Big Data into smaller and more specific categories, it will become clearer and easier how to implement Big Data. We therefore suggest that research is done to further explore

the two application areas and, if necessary, investigate if they should be divided into even smaller and more specific categories.

Also, further research should explore if the different application areas would demand different approaches and different organizational structures. Today, our empirical findings are mostly based on organizations that have developed Customer Analytics, more than they have developed Process Analytics. The question is therefore if a company were to focus more on Process Analytics than Customer Analytics, is there another organizational structure that is more suitable?

Further research should also focus on the ethics strategy for companies. Our research shows that both companies and customers have a fear of the potential of Big Data. We are certain that further research within this topic could help companies overcome the ethical issues that Big Data creates. Further research should go deeper into our findings and try to answer questions like: How can a company communicate their ethics strategy to customers and users in a way so that neither parties feel fear or uncertainty? How can companies avoid that sensitive, personal data or insights end up in the hands of a third party, like a government, so that they can track the data to an individual?

Our result is a good indicator of the situation in Sweden. We believe that the results would have been different if this study took place in another country and we therefore encourage other researchers to redo this study. Comparing these results would help international companies to understand differences between countries and also help to provide more generic conclusions.

One final suggestion for further study is the outlook of Big Data. With regards to the discussion about AI and machine learning, how big can Big Data become?

References

Accenture. 2015. Accenture Technology Vision 2015: Digital business era: Stretch your boundaries. http://techtrends.accenture.com/us-en/downloads/Accenture_Technology_Vision_2015.pdf (Viewed 2015-03-17).

Agrawal, Divyakant, Bernstein, Philip, Bertino, Elisa, Davidson, Susan and Dayal, Umeshwas. 2011. Challenges and opportunities with Big Data. *Purdue University: Purdue e-Pubs*. http://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=1000&context (Viewed 2015-04-03).

Ahlbom, Helen. 2013. SKF lanserar "banbrytande innovation". *NyTeknik*. 8th of April. http://www.nyteknik.se/nyheter/automation/verkstadsautomation/article3671951.ece (Viewed 20150504).

Andersson, Elisabeth. 2009. Riktad ICA-reklam retar kunder. *Sydsvenskan*. 9th of January. http://www.sydsvenskan.se/sverige/riktad-ica-reklam-retar-kunder/ (Viewed 2015-05-06).

Arbnor, Ingeman, and Bjerke, Björn. 2009. *Methodology for creating business knowledge*. 3rd edition. London: SAGE Publications Ltd. E-book.

Bharadwaj, Anandhi S. 2000. A resource-based perspective on information technology capability and firm performance: an empirical investigation. *MIS Quarterly* 24 (1): 169-196. doi: 10.2307/3250983.

Bollier, David. 2010. *The promise and peril of Big Data*. Washington: The Aspen Institute. E-book.

Bryman, Alan and Bell, Emma. 2005. *Företagsekonomiska forskningsmetoder*. Malmö: Liber ekonomi.

Brynjolfsson, Erik and Hitt, Lorrin. 1995. Information Technology as a factor of production: The role of differences among firms. *Economics of Innovation and New Technology* 3 (3-4): 183-200. doi: 10.1080/10438599500000002.

Bughin, Jacques, Chui, Michael and Manyika, James. 2010. Clouds, big data and smart assets: Ten tech-enabled business trends to watch. *McKinsey Quarterly* August. http://www.itglobal-

services.de/files/100810_McK_Clouds_big_data_and%20smart%20assets.pdf (Viewed 2015-03-17).

Chen, Min, Mao, Shiwen and Liu, Yunhao. 2014. Big Data: A survey. *Mobile Netw App* 19 (171-209). doi: 10.1007/s11036-013-0489-0.

Crawford, Jeff, Leonard, Lori N.K and Jones, Kiku. 2011. The human resource's influence in shaping IT competence. Industrial Management and Data Systems 111 (2): 164-183. http://www.emeraldinsight.com/doi/abs/10.1108/02635571111115128 (Viewed 2015-04-10).

D'Aveni, Richard A. 1995. Coping with hypercompetition: Utilizing the 7S's framework. *Academy of Management Executive* 9 (3):45-57. doi:10.5465/AME.1995.9509210281.

Davenport, Thomas H. 1998. Putting the enterprise into the enterprise system. *Harvard Business Review* 76:121-131. http://www.researchgate.net/publication/13115706_Putting_the_enterprise_into_the_enterprise_system (Viewed 2015-04-15).

Davenport, Thomas H., Barth, Paul and Bean, Randy. 2012. How "Big Data" is different. *MIT Sloan Management Review* 54 (1): 21-24). http://sloanreview.mit.edu/article/how-big-data-is-different/ (Viewed 2015-04-15).

Davenport, Thomas H. and Dyché, Jill. 2013. Big Data in big companies. *International Institute for Analytics*. http://www.sas.com/resources/asset/Big-Data-in-Big-Companies.pdf (Viewed 2015-02-27).

Davenport, Thomas H., Harris, Jeanne G. and Cantrell, Susan. 2004. Enterprise systems and ongoing process change. *Business Process Management Journal* 10 (1):16-26. http://www.emeraldinsight.com/doi/full/10.1108/14637150410518301 (Viewed 2015-04-25).

De Mauro, Andrea, Greco, Marco and Grimaldi, Michele. 2015. What is Big Data? A consensual definition and a review of key research topics. In *AIP Conference Proceedings* 1644, 97 (2015). doi: 10.13140/2.1.2341.5048.

von Diether, Barbara. 2015. Writing chapter 3: The methodology. http://dissertationwriting.com/write-dissertation-methodology-help.shtml (Viewed 2015-03-05).

Dillow, Clay. 2013. The big data employment boom. *Fortune*. 4th of September. http://fortune.com/2013/09/04/the-big-data-employment-boom/ (Viewed 2015-03-04).

Directive 95/46/EC. 2003. The protection of individuals with regard to the processing of personal data and on the free movement of such data. *The European Parliament and the Council*. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:1995L0046:20031120:EN:PDF (Viewed 2015-02-28).

Duhigg, Charles. 2012. How companies learn your secrets. *New York Times Magazine*. 16th of February. http://www.nytimes.com/2012/02/19/magazine/shopping-habits.html (Viewed 2015-04-08).

Ferdousi, Shawkat. 2012. Cross-functional teams for corporate entrepreneurship practices. The ISM Journal of International Business 1 (4). October. http://connection.ebscohost.com/c/articles/90519441/cross-functional-teams-corporate-entrepreneurship-practices (Viewed 2015-03-17).

Future Foundation. 2015. *Big Data: Insights for travel & tourism*. http://www.wttc.org/-/media/files/reports/special%20and%20periodic%20reports/wttc_big_data_report_final.pdf (Viewed 20150505).

Gonzalez, Marta C., Hidalgo, César A. and Barabási, Albert-László. 2008. Understanding individual human mobility patterns. *Nature* 453: 779-782. doi: 10.1038/nature06958.

Gupta, Harshit. 2015. Weather - the original big data application. *Harvard Business School Open Forum*. 14th of April. https://openforum.hbs.org/challenge/understand-digital-transformation-of-business/data/weather-the-original-big-data-application (Viewed 20150505).

Habermas, Jürgen, Lenhardt, Christian and Weber Nicholsen, Shierry. 1990. *Moral consciousness and communicative action*. Cambridge: MIT Press.

Hill, Kasmir. 2012. How Target figured out a teen girl was pregnant before her father did. *Forbes*. 16th of February. http://www.forbes.com/sites/kashmirhill/2012/02/16/how-target-figured-out-a-teen-girl-was-pregnant-before-her-father-did/ (Viewed 20150504).

Hitt, Michael A., Nixon, Robert D., Hoskisson, Robert E. and Kochhar, Rahul. 1999. Corporate entrepreneurship and cross-functional fertilization: activation, process and disintegration of a new product design team. *Entrepreneurship: Theory and Practice* Springg99 23 (3): 145-167. http://eds.a.ebscohost.com/eds/pdfviewer/pdfviewer?sid=ddb47ff0-5f9f-4d8b-bbb5-a24e555f992a%40sessionmgr4002&vid=16&hid=4213 (Viewed 2015-04-17).

Höst, Martin, Regnell, Björn and Runeson, Per. 2006. *Att genomföra examensarbete*. Lund: Studentlitteratur AB.

Ifinedo, Princely. 2008. The impact of business vision, top management support, and external expertise on ERP success. *Business Process Management Journal* 14 (4):551-568. http://www.emeraldinsight.com/doi/abs/10.1108/14637150810888073 (Viewed 2015-04-25).

IBM. 2015. The four V's of Big Data. *IMB Big Data and analytics hub.* http://www.ibmbigdatahub.com/infographic/four-vs-big-data (Viewed 2015-03-16).

Jex, Steve M. and Britt, Thomas W. 2008. *Organizational psychology: A scientist-practitioner approach*. Hoboken: John Wiley & Sons Inc. E-book.

Koops, Bert-Jaap. 2011. Forgetting footprints, shunning shadows: A critical analysis of the 'Right to be forgotten' in Big Data practice. *SCRIPTed* 8 (3): 229-256. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1986719 (Viewed 2015-04-08).

Larsson, Erik B. 2013. Building trust in the power of "Big Data" research to serve the public good. *The Journal of the American Medical Association* 309 (23): 2443-2444. doi: 10.1001/jama.2013.5914.

LaValle, Steve, Lesser, Eric, Shockley, Rebecca, Hopkins, Michael S. and Kruschwitz, Nina. 2011. Big Data, Analytics and the path from insights to value. *MIT Sloan Management Review* 52 (2): 20-32). http://sloanreview.mit.edu/article/big-data-analytics-and-the-path-from-insights-to-value/ (Viewed 2015-03-17).

Liu, Ying. 2014. Big Data and predictive business analytics. *Journal of Business Forecasting* 33 (4): 40-42. http://eds.b.ebscohost.com/eds/pdfviewer/pdfviewer?sid=e12992c0-3c26-481f-afbc-458440c33891%40sessionmgr111&vid=3&hid=120 (Viewed 2015-03-20).

Manyika, James, Chui, Michael, Brown, Brad, Bughin, Jacques, Dobbs, Richard, Roxburgh, Charles and Hung Buyers, Angela. 2011. Big Data: The next frontier for

innovation, competition and productivity. *McKinsey Global Institute*. http://www.mckinsey.com/insights/business_technology/big_data_the_next_frontier_for_innovation (Viewed 2015-03-17).

McCarthy, John and Feigenbaum, Ed. 1990. In Memoriam: Arthur Samuel: Pioneer in machine learning. *AI Magazine* 11 (3): 10-11. http://www.aaai.org/ojs/index.php/aimagazine/article/view/840/758 (Viewed 2015-03-17).

McDonough III, Edward F. 2000. Investigation of factors contributing to the success of cross-functional teams. *Journal of Product Innovation Management* 17: 221-235. doi: 10.1016/S0737-6782(00)00041-2.

Mingers, John and Walsham, Geoff. 2010. Toward ethical information systems: The contribution of discourse ethics. *MIS Quarterly* 34 (4): 833-854. https://brainmass.com/file/1495913/mis+quarterly.pdf (Viewed 2015-04-27).

Morse, Janice M. and Mitcham, Carl. 2002. Exploring qualitatively-derived concepts: Inductive - Deductive pitfalls. *International Journal of Qualitative Methods* 1 (4): 28-35). http://ejournals.library.ualberta.ca/index.php/IJQM/article/view/4589/3770 (Viewed 2015-04-23).

Muehlhauser, Luke. 2013. Intelligence explosion FAQ. *Machine Intelligence Research Institute*. http://intelligence.org/files/IE-FAQ.pdf (Viewed 2015-03-19).

Osterwalder, Alexander and Pigneur, Yves. 2010. *Business Model Generation: A handbook visionaries, game changers and challengers.* Hoboken: John Wiley & Sons Inc. E-book.

Parmar, Rashik, Mackenzie, Ian, Cohn, David, and Gann, David. 2014. The new patterns of innovation: How to use data to drive growth. *Harvard Business Review* January - February 2014.

Parr Rud, Olivia. 2009. Business Intelligence success factors: Tools for aligning your business in the global economy. Hoboken: John Wiley & Sons Inc.

Patel, Runa and Tebelius, Ulla. 1987. *Grundbok i forskningsmetodik*. Lund: Studentlitteratur AB.

Porter, Michael E. 1996. What is strategy? *Harvard Business Review* 74 (6): 2-22. https://hbr.org/1996/11/what-is-strategy (Viewed 2015-04-10).

Richards, Neil M. and King, Jonathan H. 2014. *Wake Forest Law Review* 49: 393-432. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2384174 (Viewed 2015-04-10).

Riksdagen. 2011. *Betänkande 2010/11:TU20 - Ändrade regler för elektroniska kommunikationer och andra IT-politiska frågor.* http://www.riksdagen.se/sv/Dokument-Lagar/Utskottens-dokument/Betankanden/Arenden/201011/TU20/ (Viewed 2015-03-03).

Rowley, Jennifer E. 2002. Reflections on customer knowledge management in e-business. *Qualitative Market Research: An International Journal* 5 (4): 268 - 280. http://www.emeraldinsight.com.ludwig.lub.lu.se/doi/pdfplus/10.1108/13522750210443227 (Viewed 2015-03-29).

Rowley, Jennifer E. and Slack, Frances. 2001. Leveraging customer knowledge ‐ profiling and personalisation in e ‐ business. *International Journal of Retail & Distribution Management* 29 (9): 409 - 416. http://www.emeraldinsight.com/doi/full/10.1108/09590550110400894 (Viewed 2015-04-18).

Sambamurthy, Vallabh, Bharadwaj, Anandhi S. and Grover, Varun. 2003. Shaping agility through digital options: reconceptualizing the role of information technology in contemporary firms. *MIS Quarterly* 27 (2): 237-263. http://www.jstor.org/stable/30036530?seq=1#page_scan_tab_contents (Viewed 2015-04-17).

Sethi, Rajesh, Smith Daniel C. and Park, C. Whan. 2001. Cross-functional product development teams, creativity, and the innovativeness of new consumer products. *Journal of Marketing Research* 38:73-85. http://bear.warrington.ufl.edu/weitz/mar7786/Articles/sethi%20cross-functional%20product%20teams.pdf (Viewed 2015-04-15).

Solomon, Mildred Z. and Bonham, Ann C. 2013. Ethical oversight of research on patient care. *Hastings Center Report* 43 (1): 2-3. doi: 10.1002/hast.132.

Sundsøy, Pål, Bjelland, Johannes, Iqbal, Asif M., Pentland, Alex “Sandy” and de Montjoye, Yves-Alexandre. 2014. Big Data-Driven Marketing: How Machine Learning Outperforms Marketers’ Gut-Feeling. In William G. Kennedy, Nitin Agarwal and Shanchieh Jay Yang (eds.). *Social Computing, Behavioral-Cultural Modeling and Prediction*, 367-374. Springer International Publishing Switzerland. E-book.

Swanson, E. Burton and Ramiller, Neil C. 2004. Innovating mindfully with information technology. *MIS Quarterly* 28 (4): 553-583. http://www.jstor.org/stable/25148655?seq=1#page_scan_tab_contents (Viewed 2015-04-10).

Tableau Software. 2013. *What's the big deal about Big Data?* http://www.tableau.com/learn/whitepapers/big-deal-about-big-data#main-content (Viewed 2015-03-17).

Trebilcock, Bob. 2013. The big picture on Big Data. *Logistics Management* October 2013: 53-57. http://www.logisticsmgmt.com/view/the_big_picture_on_big_data/software (Viewed 2015-03-27).

Young, Raymond and Jordan, Ernest. 2008. Top management support: Mantra or necessity. *International Journal of Project Management* 26:713-725. doi: 10.1016/j.ijproman.2008.06.001.

Wilde, Silvio. 2011. *Customer Knowledge Management: Improving customer relationship through knowledge application*. Berlin: Springer Verlag. E-book.

Appendices

Appendix 1 – Interview template: Experts

Frågeformulär till experter från akademin och konsulter, med hög kompetens och erfarenhet inom Big Data. Intervjun inleds med en presentation av oss och vårt exjobb.

Vad är din definition av

- Big Data:

- *Vilken är din bakgrund och hur jobbar du/ni med Big Data idag?*
- *Varför har Big Data blivit ett buzzword? Vad är de största vinsterna med att anamma Big Data Analytics? Vilka företag tror du kan utnyttja möjligheterna bäst och vilka har en svårare situation?*
- *Hur bra är företag på att förstå/inse möjligheterna med Big Data? Och hur bra är dem på att utnyttja möjligheterna? Lyckas företag skapa värde med Big Data?*
- *Hur skiljer sig arbetet för företag som strukturerar om för att jobba med Big Data och de företag som redan jobbar med Big Data?*
- *Prata gärna fritt om utmaningarna med Big Data? Vad tenderar företag att göra för misstag? Hur kan man rätta till dessa misstag? Hur kan man undvika misstagen från första början?*
- *Vilka är de viktigaste aktiviteterna? Vad är det som företagen generellt måste göra bra för att lyckas? Dels i implementation och omstrukturering men också för att lyckas skapa värde.*
- *Vilka olika sätt finns det för att skapa värde (höja intäkter eller sänka kostnader) kring Big Data? Finns det några aktiviteter som kan vara värdeminskande?*
- *Några av de företag som vi pratat med känner sig begränsade i sitt Big Data-arbete på grund utav etiska själ. Hur vill folk bli övervakade och hur ska datan handskas? Prata gärna fritt om Big Data och Etik.*
- *Vi har tittat extra mycket på branscher där alla går igenom ett förändringsarbete. De påverkas av PUL och har en fysisk, och relativt gammal infrastruktur. Prata gärna fritt om denna gruppering? Vad kännetecknar den och hur skiljer den sig från andra?*
- *Har du några tips på artiklar, modeller eller liknande som du tycker vi borde kolla upp?*
- *Finns det något du vill tillägga? Något som du tycker är intressant eller något som du tycker att vi har missat?*
- *Får vi vid senare tillfälle återkomma med följdfrågor till dig?*

Appendix 2 – Interview template: Organization representatives

Frågeformulär till företagsrepresentanter vilka arbetar med Big Data dagligen. Intervjun inleds med en presentation av oss och vårt exjobb.

Vad är din definition av

- Big Data:
- Affärsmodell:
- Big Data-affär:

- *Vad är din bakgrund och hur jobbar du och ditt företag med Big Data idag?*
- *Hur, när och varför initierades insamlingen av Big Data och Big Data Analytics hos er? Hur beslutades det vilken typ av data ni skulle samla in? Och varför?*
- *Hur ser ert kundsegment ut? Har det skapas nya kunder sedan ni initierade ett arbete med Big Data Analytics (BDA)?*
- *Vilket värde är det som ni skapar i och med ert arbete med Big Data? Vad är det ni försöker uppnå och vilken potential ser du med ert arbete?*
- *Vilka metoder använde ni för analys av datan? Vilka tekniska faktorer förlitar ni er på?*
- *Vad ändrade ni i organisationen i samband med er Big Data implementation? Hur gick förändringsarbetet? Vad var svårt, vad var lätt? Vad var kostsamt? Vad ansågs vara mest nödvändigt? Hur har er resa sett ut i helhet?*
- *Vad hade ni gjort annorlunda idag om samma situation uppstått?*
- *Om du skulle uppge några framgångsfaktorer, vilka skulle de vara? Vilka är era viktigaste aktiviteter? Vad är det som ni är riktigt bra på och vad är det ni gör som är väldigt viktigt?*
- *Varför tror du att ni lyckades mindre bra med? Varför är det så? Hur skulle ni kunna ha undvikit att göra eventuella fel ni gör idag? Och hur kan ni rätta till dem/effektivisera ert arbete, utifrån ett Big Data perspektiv?*
- *Vilka aktiviteter kan vara värdeminskande? Vilka bör man undvika som kanske inte är självklara vid första anblick?*
- *Tala gärna fritt om etik och Big Data och hur det påverkar er, din bransch eller Big Data i helhet? Vad är utmaningarna? Hur kan man ta sig förbi dem?*
- *Har du några tips på artiklar, modeller eller liknande som du tycker vi borde kolla upp?*
- *Finns det något du vill tillägga? Något som du tycker är intressant eller något som du tycker att vi har missat?*
- *Får vi vid senare tillfälle återkomma med följdfrågor till dig?*

LUND UNIVERSITY

Tryckeriet i E-huset, Lund 2015