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Business Intelligence

Critical Factors for BI Success

Business Intelligence

Kritiska framgångsfaktorer för BI

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Abstract

Big Data can be used for discovering new business facts, but the data itself isn't enough, it takes the use of Business Intelligence (BI) in order to discover these new business facts. BI transforms data into useful information and deliver actionable information to decision makers. BI is nowadays a high priority for many companies, but a substantial number of companies struggle to realize their expected benefits of BI. The implementation of BI is very complex, and requires resources and appropriate infrastructure over a long period of time. The complex nature of BI in combination with the lack of research describing the design and use of BI in actual real companies, especially in a Swedish context, motivates a study like this. The aim of this thesis is to present new empirical insight to the knowledge of critical success factors related to BI, in a Swedish context. The following research question was formulated:

What are the critical success factors related to the use of BI?

The research question was answered through a qualitative study based on semi-structured interviews. The findings confirm previous research regarding the critical success factors related to BI, and imply that the critical success factors for the Swedish market aren't different from the global market. Furthermore, the findings reveal that different stakeholders have different views regarding the appropriate level of self-service BI.

Key words: Business Intelligence, Critical success factors, Self-service BI

Abstrakt

Big Data kan användas för att upptäcka ny affärsinformation, men datat på egen hand är inte tillräckligt, Business Intelligence (BI) behövs för att kunna få fram affärsinformationen. BI förvandlar data till användbar information och levererar värdefull information till beslutsfattare. BI är nu för tiden en hög prioritet för många företag, men en betydande del av dessa företag har svårt att realisera deras förväntade nytta av BI. Att implementera BI är väldigt komplext och kräver resurser och lämplig infrastruktur över lång tid. Komplexiteten gällande BI i kombination med brist på forskning kring användandet av BI i verkliga företag, framförallt i en svensk kontext, motiverar en studie som den här. Syftet med denna uppsats är att presentera nya empiriska insikter gällande kritiska framgångsfaktorer för BI, i en svensk kontext. Följande forskningsfråga formulerades:

Vilka är de kritiska framgångsfaktorerna relaterade till användandet av BI?

Forskningsfrågan besvarades genom en kvalitativ studie baserad på semistrukturerade intervjuer. Resultaten bekräftar tidigare forskning och antyder att de kritiska framgångsfaktorerna for den svenska marknaden inte skiljer sig från den globala marknaden. Vidare visar resultaten att olika intressenter har olika syn på lämplig nivå av self-service BI.

Nyckelord: Business Intelligence, Kritiska framgångsfaktorer, Self-service BI

Acknowledgements

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Jonatan Holmqvist

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Förord

Jag vill tacka alla som har varit involverade i arbetet med den här uppsatsen. Först och främst vill jag tacka alla respondenter som har bidragit med sin tid och värdefull information. Vidare vill jag tacka min handledare Urban Ask som har stöttat mig under uppsatsen gång, både med sin positiva attityd, och med sin breda kunskap inom BI. Slutligen vill jag säga att det har varit väldigt givande att undersöka det valda ämnet för den här uppsatsen och att träffa alla som ställt upp på intervjuer.

Jonatan Holmqvist

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1 Introduction

The vast amounts of data generated by Enterprise Resource Planning systems (ERP) are nowadays being consolidated, transformed, and analyzed by Business Intelligence (BI) solutions (Hawking & Sellitto, 2010). Furthermore, the concept of Big Data has received quite some attention for a number of years now and was actually seen as a serious problem in the early 2000s when technology couldn't keep up with the skyrocketing data volumes (Russom, 2011). However, since then, Big Data has gone from something unaffordable and unmanageable to something that companies embrace and explore in order to discover things about their business that they didn't know before (Russom, 2011). According to McAfee and Brynjolfsson (2012), data-driven decisions are better decisions, and by using Big Data managers are enabled to take decisions based on evidence rather than intuition. The volume, velocity and variety of Big Data are creating a lot of innovation opportunities, but also challenges in terms of technical capacity (Chiang et al, 2012). According to Chiang et al (2012) the biggest challenge is to create capabilities that will facilitate the understanding and interpretation of Big Data in order to take advantage of the opportunities that it provides.

Big Data helps companies in their decision making, and in a study conducted by McAfee and Brynjolfsson (2012), companies in the top third of their industry in the use of data-driven decision making were both more productive and profitable than their competitors. The more a company characterize itself as data-driven, the better it performs (McAfee & Brynjolfsson, 2012). The massive amounts of detailed information that Big Data brings can be used for discovering new business facts that no one in the company knew before (Russom, 2011). But the data itself isn't enough, in order to discover these new business facts, the use of BI is necessary. BI transforms data into useful information (Golfarelli et al, 2004) and can deliver actionable information for decision makers, which according to Negash (2004) is essential for today's managers.

BI is considered a high priority for many companies and research has shown that companies that are able to successfully utilize the potential of BI, on average receive a return on investment (ROI) of 401 percent during the course of a three-year period (Hawking & Sellitto, 2010; IDC, 1996). However, research also shows that a substantial number of companies struggle to realize their expected benefits of BI and sometimes

even declare the BI project itself to be a failure (Chenoweth et al, 2006; Johnson, 2004). With that said, it's evident that the benefits and positive effects of BI shouldn't be taken for granted and that it takes a lot of work in order for BI to be successful. The interest for BI clearly exists (Ask, 2013), and there's some research dealing with the critical success factors related to BI (Hawking & Sellitto, 2010; Yeoh & Koronios, 2010; Isik et al, 2013; Popovič et al, 2012).

The implementation of a BI system isn't like a conventional application-based IT project, it isn't merely about putting software and hardware together, it's much more complex than that, and requires resources and appropriate infrastructure over a long period of time (Yeoh & Koronios, 2010). According to Presthus (2015), organizations only use a fraction of their BI solutions, leading to missed business opportunities. The complex nature of BI in combination with the fact that there's a lack of research describing the design and use of BI in actual real companies (Ask, 2013), and especially in a Swedish context, motivates a study like this.

1.1 Purpose and research question

This aim of this thesis is to present new empirical insight to the knowledge of critical success factors related to BI, but in a Swedish context. Since there's a lack of academic research in this field from the Swedish market, this thesis will aim to bridge that academic gap. The following research question was formulated to guide the research:

What are the critical success factors related to the use of BI?

1.2 Delimitations

For this thesis to be completed within the given timeframe of this course, a number of limitations had to be made. Even though the technical and architectural aspects of BI will be mentioned, this thesis will not immerse itself in the technical area of BI. Instead it will primarily focus on the organizational aspects. Nor will this thesis investigate BI from a global perspective, but instead from a Swedish perspective. Therefore, the conclusions of this thesis are made primarily for the Swedish market.

1.3 Structure

After the introduction, which reveals that there's limited academic research within the chosen subject for this thesis, the theoretical foundation is presented. This includes definitions of BI, a description of self-service BI, and previous research regarding critical success factors related to BI. After the theoretical foundation, the research design, research setting and methodology are thoroughly described. The next section presents the empirical findings, based on the interviews that have been conducted. After that, the empirical findings are discussed and analyzed in relation to prior research within the field. Then lastly, the conclusions drawn from the analysis in the previous section are presented, and suggestions for future research will also be discussed.

2 Theoretical foundation

This section will present definitions and information regarding Business Intelligence in general, and previous research regarding critical success factors for BI in particular. This section provides a theoretical background which will give a deeper knowledge regarding BI, self-service BI, and critical success factors related to BI. This theoretical framework will then be used to analyze the empirical findings.

2.1 Definition of BI

The term BI was popularized by an analyst at Gartner named Howard Dressner. He started using the term in the early 1990s, and it's nowadays widely used, especially amongst practitioners, when describing analytic applications (Watson & Wixom, 2007). BI was born to fulfill the managers´ need when it came to effectively analyzing the enterprise data and ultimately gaining a better understanding of their business and improving the decision making process (Golfarelli et al, 2004).

There's a vast variety of definitions of BI, but one of the more accepted ones is this one:

"*It's an umbrella term that defines a broad range of applications, technologies and methodologies that support a user's access to, and analysis of, information for making decisions and managing performance"* (Gartner Group, 2011).

A similar definition is also provided by Forrester Research:

"Business Intelligence is a set of methodologies, processes, architectures, and technologies that transform raw data into meaningful and useful information used to enable more effective strategic, tactical, and operational insights and decision-making" (Evelson, 2010, p.3)

In order to get a complete picture of the BI market, Evelson (2010) says that one has to consider that his definition of BI also includes technologies such as data warehousing, data integration, data quality, text and content analytics, and master data management, taking the whole "data-to-insight" process into account.

Furthermore, a widely used definition of BI systems that's in line with both previous definitions of BI, looks like this:

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

2.1.1 BI as a process, technology and product

Furthermore, Shollo and Kautz (2010) and Chee et al (2009) did a review of BI definitions in their respective studies and distinguished three different approaches to the definition of BI: *process, technology* and *product.*

- *Process* – According to Shollo and Kautz (2010), BI is a process in the sense that it's composed of methods that organizations can use in order to harness and develop useful information, and consequently make better decisions. Chee et al (2009) describe this approach in a similar way, namely as a process of collecting data from internal and external sources and then analyzing them to generate information that will improve the decision making.

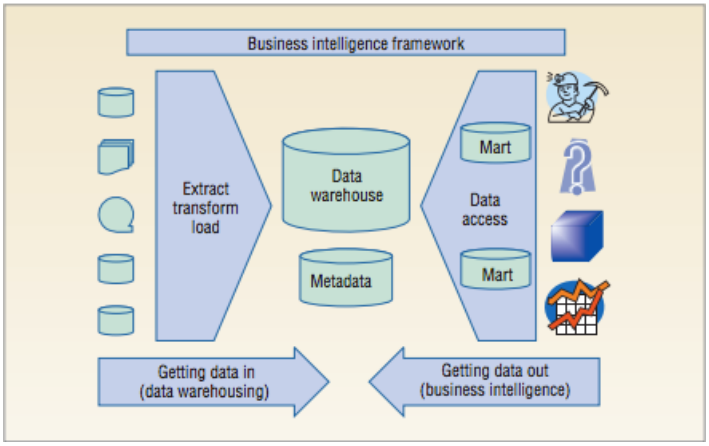
- *Technology* – The focal point of this approach on the tools and technologies that will allow the recovery, recording, manipulation and analysis of information

(Chee et al, 2009). Shollo and Kautz (2010) mention the aspect of technologies as the technologies used when collecting and analyzing business information.

- *Product* – This view looks at BI as a result or product of in-depth analysis related to detailed business data and analysis practices using BI tools (Chee et al, 2009). Shollo and Kautz (2010) say that BI as a product is knowledge and relevant information that helps organizations to better predict the behavior of their internal and external environment.

However, other studies define BI as a composition of all three of the above mentioned approaches or dimensions, rather than being separated from each other (Shollo & Kautz, 2010; Shariat & Hightower, 2007).

Regarding BI as a process, Watson and Wixom (2007) further explain that BI essentially includes two primary activities, namely getting data in and getting data out, which is illustrated below as the BI framework:



Source: Watson and Wixom (2007) p.97

The first part, getting data in, traditionally means moving data from a number of source systems into an integrated data warehouse. The technical platforms and data structures of the source systems are usually heterogeneous, and sources can lie both within and outside the organization (Watson & Wixom, 2007). The most challenging aspect of BI is getting data in, as it takes up about 80 percent of the time and generates more than 50 percent of unexpected costs related to projects. There can be several different reasons

as to why getting data in is challenging, such as poor data quality from the source systems, legacy technology and uncertainties regarding data ownership (Watson & Wixom, 2007). However, the full value of the collected data is only realized when users and applications use it to make decisions, therefore getting data out is as important as getting data in. Business users and applications access the data from the data warehouse, and use it for making decisions (Watson & Wixom, 2007).

2.2 Self-Service BI

Imhoff and White (2011) claim that organizations must use BI to make faster, smarter decisions, and that they must have better access to information in the right format and at the right time in order to able to make those decisions. An approach to satisfy this demand is self-service BI, and one commonly quoted definition is:

"The facilities within the BI environment that enable BI users to become more self-reliant and less dependent on the IT organization. These facilities focus on four main objectives: easier access to source data for reporting and analysis, easier and improved support for data analysis features, faster deployment options such as appliances and cloud computing, and simpler, customizable, and collaborative end-user interfaces" (Imhoff & White, 2011, p.4).

2.2.1 Levels of Self-Service

According to Alpar and Schulz (2016), the concept of self-service can be implemented at three different levels, depending on what tasks that are made possible for the users, namely: *usage of information, creation of information* and *creation of information resources*.

- *Usage of Information* – This is the lowest level, and the users receive access to already created information or existing reports. The big advantage of this level is that it's well suited for "normal" users, not needing any tool or analytical skills. Basic information and insights can easily be derived, however, for deeper and more specific information, this level is not flexible enough, since it requires a BI specialist to prepare the data (Alpar & Schulz, 2016).

- *Creation of Information* – At this level, the users can be granted access to some of the data available in the system to create new information from. The logic behind this level is that others cannot predict the appropriate views or needs that the users may have. The users at this level are not dependent on BI specialists, they can to a certain degree on their own select the data they need. This "freedom" does however come with the risk of incorrect data excerpts being selected by users that may have a lower degree of experience and knowledge regarding complex data relationships in the background (Alpar & Schulz, 2016).

- *Creation of Information Resources* – As oppose to traditional BI systems where data from various sources are combined and presented to the user as a unified source, users at this level of self-service can be given the option to by themselves harness new data sources for analysis, which aren't processed beforehand by IT. New information resources can be created by combining the new harnessed data with corporate data. Possible pitfalls of this level are the usage of poor quality data or violating existing access rules (Alpar & Schulz, 2016).

Worth taking into consideration is that more flexibility to the users also requires more BI skills from the users (Spahn et al, 2008), and therefore self-service BI doesn't have the same meaning for all users (Alpar & Schulz, 2016). The fit between BI tools and users must be based on the users' informational demands, computer skills, analytical skills, and specific tasks (Eckerson, 2014).

2.3 Critical success factors

First of all, the concept of a critical success factor originates from Daniel (1961) where he discussed the identification of success factors in business. Daniel (1961) claimed that each industry would have three to six of these factors, and that tasks associated with these success factors had to be executed well in order for a company to be successful. A further development of critical success factors was made through interviews with chief executives by Rockart (1979), and as a result of these interviews he claimed that:

"Critical success factors are, for any business, the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization. They are the few key areas where "things must go right" for the business to flourish. If results in these areas are not adequate, the organization´s efforts for the period will be less than desired. As a result, the critical success factors are areas of activity that should receive constant and careful attention from management" (Rockart, 1979, p.85).

2.3.1 Critical success factors related to BI

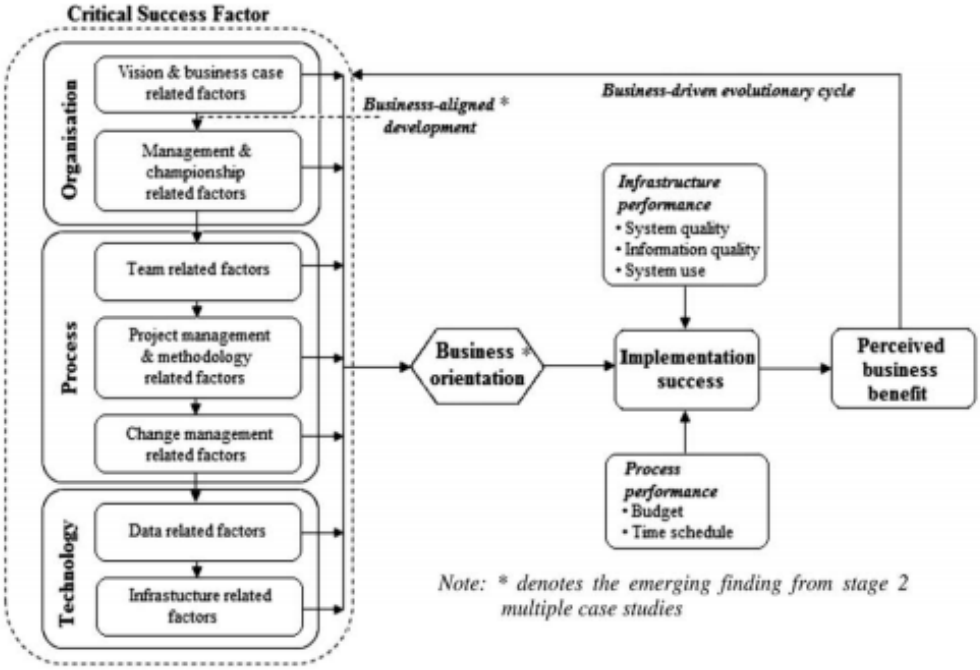
Even though there´s been studies conducted regarding critical success factors in relation to ERP system use and implementation (Holland & Light, 1999; Somers & Nelson, 2001; Sumner, 2000), relatively few studies have been made to find out more about BI practices in general and the critical success factors of BI in particular (Chenowth et al, 2006; Sammon & Adam, 2004; Popovič et al, 2012). However, Hawking and Sellitto (2010) have conducted one of those studies, and they present a number of different critical success factors such as data quality (Wixom & Watson, 2001; Rudra & Yeo, 2000), management support (Watson & Haley, 1998; Little & Gibson, 2003), business driven approach and defined business objectives (Sammon & Finnegan, 2000; Mukherjee & D'Souza, 2003), clear vision and business case (Yeoh & Koronios, 2010), and flexibility or in other words ability to adjust business requirements (Farley, 1998). A lot of the identified success factors in relation to BI aren't unique to BI and can be applied to other information system (IS) projects as well, but according to Hawking and Sellitto (2010) there's one success factor that's in fact unique for BI, and that's the need to integrate data from different source systems.

Isik et al (2013) claim that user access, data quality and the integration of BI with other systems are necessary capabilities for BI success, and they claim that this is the case regardless of the decision environment. However, the effects of some BI capabilities are moderated by the characteristics of the decision environment itself, indicating that BI systems aren't "one size fits all", and that the context in which BI operates should be taken into account (Isik et al, 2013).

In line with the research of Isik et al (2013), Popovič et al (2012) state that data integration is the starting point when implementing a BI system, and issues such as data quality, data transformation and data security must be taken care of, or else they'll prevent getting the results from BI that an organization wish to obtain. Popovič et al (2012) further present a BI systems success model in which *information content quality* and *information access quality* are incorporated. These two terms are relatively self-explanatory, but they refer to the actual information itself and its quality, and the delivery process and the channel by which information is accessed.

2.3.2 Model of success in BI

Yeoh and Koronios (2010) also contribute to the BI area with their article "Critical success factors for business intelligence systems" where they categorize critical success factors for implementing BI systems into three different dimensions: *organizational, process* and *technological.* The different dimensions are illustrated in the model of success in BI, which can be seen in the figure below:



Source: Yeoh and Koronios (2010) p.25

Starting with the *organizational dimension*, Yeoh and Koronios (2010) claim that the most important factor for BI system implementation is committed management support and sponsorship, which makes it easier in getting the necessary operating resources such as human skills and funding. Both Yeoh and Koronios (2010) and Watson et al

(2001) say that it's more beneficial if the BI sponsor comes from the business side of the company rather than from the IT function. Furthermore, a clear vision and well-established business case is needed as BI is driven by business, this will help to direct the implementation of BI. Yeoh and Koronios (2010) claim that the strategic vision and the business case must be aligned in order to cater the business objectives and needs of the company. If for example there's a lack of understanding regarding the business vision, it would eventually affect the adoption and outcome of BI (Yeoh & Koronios, 2010).

The first critical success factor in the *process dimension* is to have someone involved that understands the business, in other words a champion from the business side, because he or she will view the BI system from a strategic and organizational standpoint, contrary to a person for example from IT that would perhaps focus too much on the technical issues (Yeoh & Koronios, 2010). The second critical success factor of this dimension is a business-driven and iterative development approach, and this factor is well described by a participant in the study by Yeoh and Koronios (2010):

"*The success of 90 percent of our project is determined prior to the first day. This success is based on having a very clear and well-communicated scope, having realistic expectations and timelines, and having the appropriate budget set aside"* (Yeoh & Koronios, 2010, p.27).

The third and last factor of the process dimension says that it's critical to have a user-oriented change management. According to Yeoh and Koronios (2010) it's evident that key users must be involved during the BI implementation, as they can provide input that otherwise may be overlooked by the BI team. Compared to an architect or developer, users know what they need better and therefore their participation is important.

The last dimension is the *technological dimension*, and the first critical success factor is related to the dynamics of business and the evolvement of information needs. The technical infrastructure of a BI system must be scalable and flexible to be able to expand easily when information needs change, and the needs of the business change (Yeoh & Koronios, 2010). The other critical success factor is sustainable data quality and integrity.

The quality of the data is crucial for the successful implementation of a BI system, and especially the data from the source systems. A poor data quality will obviously have a negative effect on management reports, and in turn also the decision making. It's only possible to integrate and exploit corporate data to the fullest once the data quality and integrity are secured, only at that point is it possible to extract any business value from the data (Yeoh & Koronios, 2010).

3 Methodology

This section starts by describing the research and scientific approach. Moving on, the selection process and the interviewees that have participated in this thesis will be described. Lastly, a section regarding validity and reliability will be presented.

3.1 Research and scientific approach

A qualitative research approach is characterized by a data collection with focus on soft data. The data collection often consists of qualitative interviews, interpretive analyses and where verbal analysis methods of text materials are used (Patel & Davidson, 2003). A result in the shape of words instead of numbers is also characteristic for a qualitative study, and to generate a theory rather than to test a theory is another characteristic. During the course of a qualitative study, a higher degree of subjective research is applied compared to a quantitative study (Bryman, 2008). A qualitative approach and interviews was chosen for this thesis, allowing for a deeper analysis and deeper understanding of the subject matter in this thesis (Holme & Solvang, 1991).

Moving on, it's obvious that interpretation is important when trying to present the most relevant result as possible from interviews. Therefore, hermeneutics has been taken into consideration for this thesis. Hermeneutics is the method or theory of interpretation and is seen as the opposite of positivism, which has an objective stance, whereas the approach of hermeneutics considers the theoretical knowledge and subjective experiences of the researcher as a natural part of the qualitative interview (Esaiasson et al, 2012; Patel & Davidson, 2003). It's also important for the interviewer to be aware of his or hers own possible effect on the interview. A lot of researchers within the field of hermeneutics claim that one should as little as possible affect the result of the interview with ones' own knowledge within the given area, in order to not affect the result for the

thesis (Patel & Davidson, 2003). It has been a conscious choice for this thesis, to avoid expressing personal opinions or knowledge during the interviews, in order to not affect the answers of the interviewees in any way, shape or form.

3.2 Data collection

Primary data is information or material that has been collected directly by the researcher, and secondary data is data already existing and published within a given field (Esaiasson et al, 2012). The collected data for this thesis is primary data, which has been collected through semi-structured interviews. Interviews have the potential to capture qualitative and exploratory data, in addition to being flexible in the data collection process (Yin, 2003). Semi-structured interviews mean that there's a mix of structured and unstructured interview questions. The interview questions were structured in the sense that they were asked to the interviewees in the same order, and unstructured as additional interview questions sometimes arose during the interviews, and according to Patel and Davidson (2003), this mix of interview questions defines a semi-structured interview. Esaiasson et al (2012) further define unstructured interview questions as open questions, where the possibility for answering only yes or no is rare, and by this definition, the interview questions for this thesis are to a high degree unstructured. According to Bryman (2008), semi-structured interviews can be used for providing balance between structure, to satisfy the research question, and facilitation of exploration, and this was certainly the case for this thesis.

After reviewing previous research and existing theory, an interview guide was developed which Bryman (2008) claims is one of the key aspects of a semi-structured interview. The interview guide was made with enough structure to ease comparison, but at the same time flexible in order for the interviewees to be able to respond freely. The full interview guide can be found in Appendix A. Regarding the definition of BI, the purpose of asking this question to the interviewees was to find out their definition and view of BI in order to get a deeper understanding of their standpoint.

As previously mentioned, the collected data is primary data, but the theoretical foundation consists of secondary data. Worth noting regarding the secondary data is the fact that a lot of the previous research, and especially in the field of self-service BI, is

from symposiums and conferences. This implies that there's not a lot of published academic research, which should be taken into consideration when critically reviewing the literature.

3.3 Selection process

The selection process started out with determining which companies and persons that would be suitable for the chosen subject matter. For this thesis it meant respondents that were experts (BI supplier), specialists/consultants (BI consultant/specialist) and some sort of super user working with BI on a day-to-day basis (BI user), and of course active on the Swedish market. The BI suppliers are experts within their field, the BI consultants/specialists are specialists and very knowledgeable of BI in general, and also works both with BI suppliers and BI users, and lastly the BI users don't necessarily have the BI knowledge of the two other groups of respondents, but their more practical perspective is as important for this thesis. The intention of this variety of respondents was to acquire different aspects of BI to build up a holistic picture regarding critical success factors on the Swedish market, and of course approach the research question in a proper manner.

According to Jacobsen (2002) the researcher should select the respondents based on who he or she thinks has the most knowledge within the subject. As for the BI suppliers, Gartner's Magic Quadrant for BI and Analytics Platforms (Parenteau et al, 2016) was used, and after that the selection process progressed very smoothly as one of the BI specialists/consultants, who besides being one of the interviewees also provided contact information to both of the BI suppliers and one of the BI users. The remaining BI specialist/consultant and BI user both works at the same IT company as the author, which of course facilitated the selection process. A short description of each participant will follow in the next section.

A total of six interviews were conducted for this thesis, ranging from 45-120 minutes, and the interview questions were based on the theory. Due to logistical reasons the interviews were conducted in various formats, which were in-person, via Skype, through video conference, and by phone. In an ideal world, all of the interviews would have been conducted in-person, but this just wasn't possible, and even though the length and

format of the interviews varied, the quality of the interviews was still on an even level. In other words, the length of the interviews or the way they took place didn't have a significant impact on the quality of the interviews.

3.4 Participating companies and persons

The participating companies and persons will be held anonymous for convenience purposes, as a few of the interviewees don't wish to be named. Hence, the interviewees will be referred to as BI Supplier A and B, BI Specialist/Consultant A and B, and BI User A and B in the methods section and conclusion, and as respondents R1-R6 in the empirical findings and discussion. An overview of the interviewees is illustrated in the table below:

Interviewee	Role/Position	Respondent
BI Supplier A	Sales Area Manager	R1
BI Supplier B	Pre-Sales Solutions Architect	R2
BI Specialist/Consultant A	Vice President/Senior Consultant	R3
BI Specialist/Consultant B	BI Application Specialist	R4
BI User A	Business Controller	R5
BI User B	Business Controller	R6

Source: The author

3.4.1 BI Supplier A and B

As mentioned before, both BI Supplier A and B were positioned as leaders in Gartner's Magic Quadrant for BI and Analytics Platforms (Parenteau, 2016), and therefore these two companies were a perfect fit and of great interest for this thesis, as they obviously have a lot of knowledge within the field of BI.

For *BI Supplier A*, an interview was conducted with the sales area manager, and this person's main tasks included working with existing customers and help them develop their use of BI. The sales area manager had been at BI Supplier A for three years, and within the IT industry for more than ten years.

The interviewee from *BI Supplier B* works as a pre-sales solutions architect which means that he or she supports account managers in different aspects, such as finding areas of use related to BI and helping out as a "problem solver". Apart from that, the interviewee also has a technical responsibility for some of the biggest customers in Sweden, and has worked for BI Supplier B for nine years.

3.4.2 BI Specialist/Consultant A and B

The BI Specialists/Consultants interviewed for this thesis are a mix of a consultant working directly towards customers, delivering decision support solutions, and a specialist working with BI internally at an IT company.

BI Specialist/Consultant A is vice president and senior consultant at a company that creates solutions and delivers systems that supports decision making, their aim is to assist their customers to facilitate decision making on a daily basis. The interviewee often functions as an advisor for his or her customers regarding BI, and has fifteen years of experience as a BI and management consultant.

BI Specialist/Consultant B works internally with developing BI for an IT company with approximately 2,000 employees. As a BI application specialist, tasks include working with business logic in the data warehouse, collecting data from various sources, and building reports requested from different users within the company. BI Specialist/Consultant B holds a Bachelor's degree in Business Information Systems/Computer Science, and has worked as a BI application specialist for almost four years at this particular IT company.

3.4.3 BI User A and B

The BI Users participating in this thesis both work at large companies that have turnovers which exceed 10 billion SEK, and they both use BI on a daily basis in order to make as accurate and correct decisions as possible. This of course made them interesting for the subject of this thesis, from a user perspective.

BI User A works as a business controller for a large company within the recycling industry. Besides the role as a business controller, this person is also project manager for

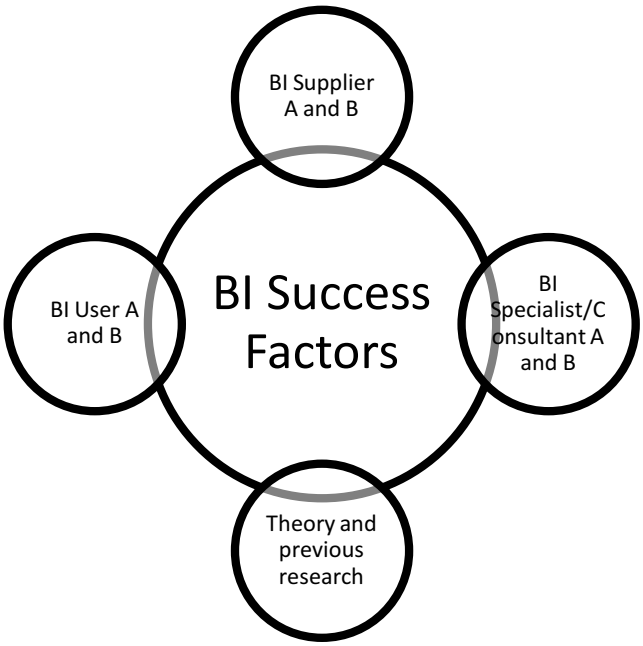
a BI program that's currently going on, where a BI structure and strategy are being developed. As a project manager for this BI initiative, focus is set on creating synergies between the different countries that the company is active in. The interviewee has worked for this company for almost two years, and prior to that, he or she worked with a BI project at a recruitment company for approximately a year.

BI User B also works as a business controller, but for a large company within the IT industry where he or she primarily works towards two internal departments. As a business controller, tasks include keeping track of accounting, key performance indicators (KPIs), sales, forecasts and so forth on a daily basis. BI User B also has an interest for BI and often gives feedback to the internal BI department regarding for example building new reports.

3.5 Data analysis

The interviews conducted for this thesis were recorded and then transcribed, and to address the research question, a thematic analysis was used in this thesis to analyze the collected qualitative data in a systematic manner (Boyatzis, 1998). A thematic analysis is a *"qualitative analytic method for identifying, analyzing and reporting patterns or themes within data"* (Braun & Clarke, 2006, p. 79). There are two approaches when it comes to thematic analysis, theory-driven on one end, and data-driven on the other. The two approaches differ in the sense that the thematic analysis can start with either theory or raw data (Boyatzis, 1998). This thesis employed both approaches as the theory were used in the analytical process, but the raw data were also used as it helped develop the identified themes from the interviews.

Moreover, the analytical process of this thesis involved comparing the empirical findings from the different stakeholders with each other, and with theory and previous research. By doing so, gaining a holistic understanding from different perspectives or stakeholders regarding the success factors related to BI was possible. An illustration of the analytical process is seen in the figure below:



Source: The author

3.6 Validity

Validity describes whether the empirical investigation is based on the direction of the theoretical level or not, or in other words, if this thesis actually investigates what it claims to investigate (Esaiasson et al, 2012). Furthermore, validity can be divided into internal validity or external validity.

Internal validity relates to whether the conclusions drawn from a situation are believable or not, it's tied to the point and time when the study was conducted. The internal validity can be increased by reducing external factors that might affect the study, factors that might hurt its credibility (Esaiasson et al, 2012). An apparent risk with a qualitative study is the fact that the respondents has an underlying agenda or interest, and because of that reason, the given information in the interviews might be biased. In an attempt to increase the internal validity for this thesis, multiple respondents from three different stakeholders of the BI market were interviewed in order to minimize the risk of biased information, and to gain a holistic view of the chosen subject for this thesis.

External validity is about the possibility to generalize conclusions from the selection of a particular study, and apply those conclusions onto other populations or situations. The

external validity can be increased by selecting respondents that are similar to each other, which would make it easier to generalize guidelines and apply them to other actors, similar to the ones in the study (Esaiasson et al, 2012). The respondents of this thesis are linked in the sense that they all have an interest for BI in some way and are active on the Swedish market, but apart from that, they have more differences than similarities, coming from different industries and different positions on the BI market.

Hence, the empirical findings and conclusions drawn from this thesis will not be claimed to be true or applicable to all markets or industries.

3.7 Reliability

Reliability describes the random or unsystematic errors in a study. The errors causing a low reliability are usually due to negligence or mistakes during the data collection process and the subsequent data processing. Errors like this can for example be caused by misunderstandings or hearing problems during interviews, or by mistakes when the collected data is processed, such as clerical errors (Esaiasson et al, 2012).

All the interviews in this study were conducted in a quiet setting in order to ensure a high reliability. Furthermore, all the interviews were recorded on multiple devices and then transcribed to reduce the risk of missing or misunderstanding any information. The transcribed material was the foundation for the empirical findings of this study, where all relevant information in relation to the purpose and research question of this study was presented.

However, qualitative research often has low repeatability, and therefore it can be hard to prove the reliability and validity of a qualitative study such as this, which should be kept in mind when reading this thesis.

4 Empirical findings

This section will present the result from the interviews. The structure of the empirical findings will be based around different themes, which are derived from the theory section and the interviews themselves. The different groups of respondents will be divided, meaning that the results of the BI Suppliers, BI Specialists/Consultants, and BI

Users will be presented on their own and not combined. The interviewees will apart from in the headlines be referred to as respondents R1-R6.

4.1 BI Supplier A and B

First off, the results from BI Supplier A and B will be presented, respondents R1-R2.

4.1.1 Definition of BI

R1 defines BI as something that helps organizations to see and understand their data, regardless where the data is located, and regardless the knowledge level of the user. R1's definition is intertwined with their mission statement, where BI isn't merely a tool that organizations can use, but rather some sort of change process. R1 states that the need to see and understand data is partly sprung out of internal communication problems that organizations have, where IT and business doesn't necessary always see eye to eye.

"Having worked a lot with IT, I've seen how hard it is for the IT department and business to have a sound and effective dialogue" – R1

R2 says that it's about value creation for the business, and that BI is just a way of accessing information and making analysis possible. The role of BI is to enable organizations to make better decisions, which in the end will create value.

"…the important thing is being able to interpret the information and the underlying data, and then compile it in order to make decisions based on that data" – R2

R2's mission statement is for their customers to be able to make better, data-driven decisions, and making analysis possible throughout the whole organization, not restricting it to for example only the financial department.

4.1.2 Self-Service BI

R1 says data should be more accessible for everyone, and traditional BI, where people from the business side have to contact the IT department when in need of for example new reports, isn't appropriate in the society in which we live in today, where questions have to be answered fast. According to R1, there's a huge difference in the way we

consume information nowadays. In the past it's mainly been about static numerical reports, but the data today is visualized in a different way. Slowly but surely, the user needs have changed.

"...children in the age of 9-10 and professors in their 80s can work with and adjust the information, which wouldn't have been possible if they were given a static report" – R1

R1 says that everyone can do their job better with data, and that self-service BI is a facilitator for this, as it can help with increasing people's commitment level in relation to data when users by themselves can adapt it.

R2 talks about how BI has evolved, that it has changed from just looking in the rear-view mirror to perhaps more of an analytical journey where organizations really want to explore the reasons as to why or why not things are going as they predicted. This has led to moving away from static reports, as more flexibility is needed, to more of a self-service approach in order for users to have more flexibility and the power to "do it" themselves. However, R2 stresses the importance of still having some sort of governance, even in the presence of self-service BI.

"We've gone from IT pushing out information to the users, to users instead being able to create a lot themselves. The visualized information still has to be correct though, which means that IT very much have to be involved to ensure that the data is valid and reliable" – R2

R2 says that another aspect of self-service BI is for users to be able to combine different data, R2 calls this "self-service data preparation", where the user has the possibility of adding new information, and combine it with already existing data. What this does according to R2, is creating new analytical opportunities for the users.

4.1.3 Critical success factors

R1 states that if a company's ambition is to become more of a data-driven organization, it's important to look at BI as a whole and make sure that both the business side and IT

department are on board. The two sides have to work together if BI and self-service BI are going to work.

"The business people are good at analyzing the data, but they're not knowledgeable regarding backups, security, and especially not regarding getting the data out of the systems" – R1

The IT department has to be involved working with the data strategy, data quality, data management, and making sure that all systems are up and running, says R1. There has to be a structured way of collecting the data and ensuring its quality. Once IT has done that, it's up to the business people to work with the data and create value from it.

"Garbage in, garbage out. You need to have a data strategy; you cannot implement self-service BI on a large scale if you don't have a data strategy" – R1

One of the most important aspects or biggest challenges according to R2 is the data access, being able to extract data from the source systems. The information itself is often correct says R2, but going through the process of getting the data into a BI system is a huge challenge, because if there's no access to the data, there's no value to be created.

R2 says that it's important to build a business case before starting a BI project, without some sort of pre-study, it's not very likely that the end result will be any good. R2 also stresses the importance of having different types of stakeholders involved in a BI project in order for the project to be successful.

"…some projects are completely operated by the IT department, and some projects are completely operated by the business side, but there has to be a mix of people from both sides involved" – R2

BI will always be more successful if the organization has a vision of where it wants to go, says R1. It's important for the business side to formulate a goal or a mission in relation to BI, so that it's clear what the organization wants to achieve.

"It doesn't necessarily have to be a goal related to the number of users, but concrete goals regarding what the organization wants to achieve, such as increased revenue, increased market share, reduce risk…" – R1

Both R1 and R2 state that the scalability and flexibility of a BI solution is important, it has to be agile, it has to be relatively easy to adjust it, and it has to be possible to increase the number of users pretty much instantly.

4.2 BI Specialist/Consultant A and B

The second part of the empirical findings will present the results from BI Specialist/Consultant A and B, respondents R3-R4.

4.2.1 Definition of BI

R3 defines BI as something that helps keeping track of things, and that the purpose of of BI is to provide decision makers with information that allows for well-founded decisions that aren't just based on someone's gut feeling, but facts as well. According to R3, BI is an aid for governing the business, regardless what business it is.

"The business becomes transparent, you understand what's and what isn't profitable. Performance measurement is done across different parts of the organization, insight is provided, and companies will see if they work in the right way or not" – R3

R4's view of BI is that it's a technique where data is collected from different sources, and some kind of value is built from that data, so that the end users can utilize that information to make decisions. At R4's workplace, there are multiple purposes for using BI, such as keeping track of results in the company and forecasting sales. As a BI application specialist, R4's mission is to find the right educational level for the reports which R4 builds. The reports have to be intelligible for the right people.

4.2.2 Self-Service BI

According to R3, there's a lot of talk nowadays about data-driven organizations, and R3 says that there's potential to transform entire industries when embracing this view, and that it's an extension of BI when companies are starting to look ahead instead of just

historically. R3 says that depending on the end user, the level of self-service BI varies. Seldom users want standardized reports which are a bit simpler, and with less parameters to choose from, while more IT driven users demand a more flexible tool, allowing them to do more themselves.

R4 says that they've tried to change to being more proactive in the sense that they've previously used data to see the results historically, which is easy, but that they'd like to use data to create forecasts and to follow trends. R4 sees self-service BI as something that will become more common in the future, with users being able to do some of the things R4 does, by themselves. As of right now, new BI reports are created by R4 whenever users ask for it.

"In our BI solution there are basically two different levels, we can either give the users some freedom and power to do a bit themselves, or limit their possibilities to do things themselves. We've chosen to limit their possibilities, because otherwise they might do something a bit crazy, if we give them too much freedom" – R4

4.2.3 Critical success factors

R3 claims that there are several different important aspects to consider for BI to be successful. First of all, it's important to understand what a company wants, some sort of specification of requirements, says R3. After that, it's crucial to have access to the right people in the organization, people from the business side.

"Above all, it's important to have business people on board. A big mistake that often occur within BI is that it's driven as an IT project, and companies forget who the real users are. Consequently, things are done which the business supposedly needs, but in the end the business people are wondering, what's this?" – R3

R3 also mentions the data itself as something important. They need to know where the data is coming from, and have access to the source system, and get help to understand the source systems. R3 says that their customers often think that they have a better data quality than they actually have, which is why they need to some sort of data quality initiative, and perhaps sort out certain processes in their source systems. The scope of

the BI project is another important factor according to R3. The scope has to be well defined, it's important not to have a too big of a scope at first, instead one should relatively fast be able to present some sort of value.

R4 says that a user-oriented approach is important, that the target group of the information always should be considered, some reports are only meant for business controllers, others are only meant for sales managers. R4 also mentions data quality as a key factor, and at R4's workplace, there's business logic built into the data layer, which means that the right things are measured in relation to sales for example.

Both R3 and R4 state that scalability is an important factor. R3 even says that it's almost a requirement nowadays, it's rare that someone builds a BI solution and never upgrades it, a BI solution that doesn't change or evolve will eventually die.

4.3 BI User A and B

The third and last part of the empirical findings will present the results from BI User A and B, respondents R5-R6.

4.3.1 Definition of BI

R5 defines BI as a tool and process for extracting information and presenting it to an end user. R5 says that BI is mainly an IT system, with the processes that comes along, such as extracting, load and structuring information. R5's primary task involves presenting basis of decision to management within different areas. At R5's workplace, they're currently occupied with a BI project, where the goal is to create synergies between five different countries, and to create a common structure that hasn't been in place before. R5 explains that they haven't had a BI strategy in the past, but right now they're implementing a BI strategy which will apply to the entire company.

BI is the primary tool for R6 on a day-to-day basis in the role as a business controller, which of course relates to R6 definition of BI, namely that BI is some sort of tool that interprets a lot of data into something meaningful or useful for any kind of business. R6 states that BI makes it a lot easier for R6 to accomplish the daily tasks given, and that BI has made it possible to be more efficient.

"Business controllers spend a lot of their time creating basis for decisions, and the BI system is where we find the data on which the basis for decisions themselves are based upon, so therefore BI is of course a very powerful tool" – R6

R5 explains that they've traditionally been rather reactive in their follow up and their decision making, but wish to become more proactive and data-driven. R5 says that BI has been used or set up in slightly different way in the various countries they operate in. No knowledge exchange, harmonization or standardization has been done between countries. R5 further explains that their aim with the BI strategy is for example to be able to share best practice amongst each other, and find out how the company should be organized in order to face the digitalization.

"So we started looking at the vision, how do we want this? And how should it like? We came to the conclusion that we should move from a current state where we don't have any common systems, any common processes, or any common concepts of BI, to the establishment of a common environment for all of that" – R5

4.3.2 Self-Service BI

R5 says that they expect practically everyone in their organization to be able to use BI. The first roll-out stage of the BI project will be aimed at advanced users, such as business controllers and analysts, that has knowledge about and can guarantee the quality of the information, but the goal is to provide BI to other users as well, ranging from sales staff, to the people managing their scrap yards. However, even though BI should be available to a lot of users in different parts of the organization, R5 explains that the self-service level should vary, depending on the user. Expert users might need an extreme level of self service, but other users, salesmen for example, probably need some sort of pre-packaged information. R5 thinks that IT should spend more time on information, the data layer, and take a centralized approach, and then they hope that business users can create reports and dashboards without being dependent on IT.

"You could say that we want to centralize the information and data quality, but decentralize the BI solution" – R5

R6 would like more of the simpler analysis to be available to more users, as it would allow for example sales managers to by themselves review certain information, instead of having to go through the business controller to acquire that particular information. As of right now, there's no way of creating reports or applications on your own, R6 have to contact the BI application specialist whenever there's a need for a new report, even though that the data exists. R6 believes that different people in the organization should have different user rights when it comes to self-service BI.

"Business controllers could for example be given the opportunity to create their own reports, while other users, such as sales managers, would have a read-only version" – R6

R5 says that a lot of users want pre-packaged information. Management for example don't always have time to adjust or adapt the data, which of course means that the data has to maintain a certain standard. R5 thinks that a completely open self-service environment is a bit unnecessary, as it could be counterproductive if users with little or no computer skills are forced to spend a bunch of time building reports.

R5 points out that even though it's important to consider the users, they actually started looking at the data, rather than looking at the front end and user needs. They wanted their BI to be independent, meaning that they wanted to be able to use any BI tool. The business logic should be built into the data layer, not the BI tool, states R5.

"The financial department might need this particular BI tool, whereas the business controllers might want something else, and the sales department may want yet another one" – R5

4.3.3 Critical success factors

R5's BI strategy started with the data. R5 says that they view information as an asset, and therefore there has to be some kind of structure related to the information in order to be able to use it to create value.

"We plugged ourselves into all countries, all source systems, and started building from the bottom with the data" – R5

R6 thinks that a user-friendly approach is an important factor for successful BI, in order for BI to be powerful and effective, it has to be easy to analyze information, and it shouldn't take a BI specialist to conduct the analysis. R6 also says that it's important to be able to trust the data quality, otherwise conclusions will be drawn from incorrect data or information, leading to inadequate decision-making.

"A salesman might say that the sales figures should be something else than what's displayed in the systems, and when looking this up, one might find that the seller has forgotten to put in that particular information, or that the system itself only updates every hour" – R6

One of the most important success factors according to R5 are the support from the business side, the people who know their information and use the BI tools, if they're not fully supportive of the vision, it will never be successful. Moreover, R5 says that it's important to simplify BI when communicating with the end users. There's no need to get all technical and talk about data layers and information structures, instead one should talk about what the end users want for their day-to-day business.

Both R5 and R6 state that scalability and flexibility are important. A flexible BI solution would eliminate analysis being done outside of the BI system, says R6, as they for example have to use Excel from time to time in order to obtain the correct information. R5 believes that the use of information will only grow, that apart from finance and sales, there are other departments, such as human resources and marketing, that also have data that potentially could be used in a better way. The BI tool has to flexible and scalable to enable the use of both internal and external information.

5 Discussion

This following section will discuss and analyze the empirical findings in relation to existing theory and previous research.

5.1 Definition of BI

As previous research shows, there's a wide variety of definitions regarding BI, and some of them are rather broad. In line with the literature, the empirical findings suggest that the variety of definitions also exist among the different stakeholders of this study. Being BI suppliers, R1-R2's mission statements are very much intertwined with their definition of BI, whereas R1 defines BI as some sort of change process, and R2 states that BI is basically a tool for better decision-making. R1's approach is similar to the process approach, while R2 has more of a technology approach (Shollo & Kautz, 2010; Chee et al, 2009).

R3 and R4 are part of the same group of respondents, but they're different in the sense that R3 works externally with customers and partners, while R4 develops BI for internal use at an IT company, therefore it's natural that their definitions of BI differ. According to Shollo and Kautz (2010), BI can be viewed as a product, meaning that organizations better can predict their environment by obtaining knowledge and relevant information. R3's definition of BI relates to the product approach, because BI is defined as something that helps companies to keep track of things, and it makes the business transparent. R4 on the other hand sees BI as a technique which in the end creates some kind of value for the end users, and lets them make the right decisions. According to Evelson (2010) and Gartner Group (2011), BI includes the methodologies and technologies that facilitate exactly what R4 says, the improvement of the decision-making.

Both BI users work as business controllers at their respective company, so both of them are occupied with decision support. R5 looks at BI as a tool and a process, combining two approaches (Chee et al, 2009) of BI, which prior studies also have shown (Shollo & Kautz, 2010; Shariat & Hightower, 2007). But apart from being a business controller, R5 is also responsible for an ongoing BI project, which of course affects R5's view of BI. Watson and Wixom (2007) explain BI as a process, where getting data in is the most challenging aspect as it takes up about 80 percent of the time. R5 seems to have embraced the view of Watson and Wixom (2007), as their main priority has been the process of getting data in, collecting data from a number of source systems into a common data warehouse. R6 on the other hand views BI strictly as a tool that interprets data into something useful. R6 also sees the potential in BI, how it can help to make

decision-making more effective, which is in line with Evelson (2010) and his definition of BI.

5.2 Self-Service BI

Regarding self-service BI and level of self-service, the empirical findings show that there are different opinions across the different stakeholders. According to Imhoff and White (2011), BI has to be used to make faster decisions, and that organizations must have better access to information to make those decisions. Both R1 and R2 have similar thoughts as Imhoff and White (2011). R1 says that data should be more accessible to everyone, and that traditional BI, where people from the business have to contact the IT department to get the information they need, just isn't fast enough in the society in which we live in today. R1 clearly states that self-service BI is a facilitator for people to do their jobs better with data. R2 says that BI has evolved, that it has gone from static reports to more of a self-service approach, as users want more flexibility and the ability to things on their own. R2 does however point out the importance of still having some sort of governance to ensure valid and reliable data. R1 and R2 promote a relatively high level of self-service BI where users shouldn't have to rely on the IT department in order to get appropriate information. They promote self-service BI probably at the second or third level, where users are able to create information, and create information resources (Alpar & Shulz, 2016), R2 even talks about "self-service data preparation", where users can add new information and combine it with existing data.

Compared to the BI suppliers, both R3 and R4 are more restrictive in their approach to self-service BI and the appropriate level of self-service. R3 says that the level of self-service varies, it all depends on the end user. Seldom users often want simpler, standardized reports, or in other words the first level of self-service, where users receive access to already created information and reports (Alpar & Schulz, 2016). R3 adds that more experienced IT users demand self-service probably at the second or third level, as they want a more flexible tool where they can do more themselves. R4 are even more restrictive as they don't allow their users to do much themselves at all. This could arguably have to do with the fact that more flexibility and self-service require more BI skills from the users (Spahn et al, 2008), and that the company that R4 works for simply feels that the users aren't mature for a higher level of self-service BI at this particular

moment. They probably feel that the risks and possible pitfalls that come with a high level of self-service BI outweigh the possibilities.

R5 and R6 both like the idea of a high level of self-service BI, but not for all users. They think that the self-service level should depend on the end user. Some users should only be able to access already created information and reports, and other more advanced users should be granted access to the data available in the systems, or even add and combine data of their own. Eckerson (2014) claims that the fit between BI tools and users must be based on the user's demands regarding information and computer skills, and both R5 and R6 seem to embrace this approach. They both want the self-service level to vary, depending on the end user, there shouldn't be a fixed self-service level across the organization. With that being said, both respondents think that the concept of self-service BI is good. R6 for example says that if there was a higher level of self-service in the company where R6 works, a lot of time could be saved if sales managers could access certain information on their own instead of having to go through the business controller.

5.3 Critical success factors

A lot of literature claim that data quality and data integration are critical success factors when implementing a BI system (Isik et al, 2013; Popovič et al, 2012; Hawking & Sellitto, 2010; Wixom & Watson, 2001; Yeoh & Koronios, 2010), and the empirical findings are very much in line with this research. All respondents in this thesis state that data quality is an important factor. Some respondents point this out this more than others, R5's entire BI project even starts with ensuring the data quality before dealing with anything else. Or as R1 puts it:

"Garbage in, garbage out. You need to have a data strategy; you cannot implement self-service BI on a large scale if you don't have a data strategy" – R1

R1 says that organizations that want to become more data-driven have to make sure to have people from the business side and the IT department on board, and they have to be able to work together. R2 agrees and says that it's important involve different types of stakeholders in BI projects, which also previous research supports (Yeoh & Koronios,

2010). Projects run completely by the IT department are not likely to succeed, says R2. R5 claims that the support from the business side is one of the most important success factors, as they are the ones that are going to use the BI tools. Both R1 and R2 state that some sort of business case and/or vision are important, which Yeoh and Koronios (2010) also claim in their organizational dimension. Yeoh and Koronios (2010) say that this will help the implementation of BI, since BI is driven by business.

All respondents say that flexibility and/or scalability in relation to BI are success factors. An agile, adjustable, and flexible BI solution is almost a requirement nowadays as R3 puts it. R6 says that a flexible BI solution would eliminate analysis being made outside of the BI system, and R5 sees scalability in relation to their BI project as something that will allow the use of information to grow and spread within the organization. Previous research states that flexibility is needed to be able to adjust business requirements (Farley, 1998), and that both flexibility and scalability are needed due to the dynamics of business (Yeoh & Koronios, 2010).

A user-oriented or user-friendly approach is important according to R4 and R6, that the target group of the information always should be considered. R6 says that BI has to be user-friendly in the sense that it shouldn't take a BI specialist to conduct an analysis, it has to be easy to analyze information. User access and information access quality are mentioned in previous research (Popovič et al, 2012; Isik et al, 2013), and they certainly relate to the user-friendly approach. Interestingly enough, R5 agrees that a user-oriented approach is important, but for them, the data quality and data integration were of greater importance, and therefore they took a different route.

6 Conclusions and future research

This section will present conclusions and suggestions for future research. The contribution of this thesis is empirical insight regarding the critical success factors related to BI. The aim of the study was to bridge the academic gap that exists within the chosen subject. The following research question was formulated:

What are the critical success factors related to the use of BI?

6.1 Conclusions

There's consensus throughout the respondents regarding the critical success factors of data quality and flexibility/scalability. All of the respondents and previous research regard those two factors as critical for the use of BI.
Furthermore, the findings reveal that even though all respondents are positive toward BI, the appropriate level of self-service in order to utilize BI to the fullest varies, depending on which stakeholder you ask. The BI suppliers promote a high level of self-service in order to utilize the full potential of BI, while the BI specialists/consultants and the BI users want a more moderate approach, where BI is governed and users aren't allowed to adjust the data however they want.

6.2 Future research

This study has focused on BI in general, but a narrower approach of BI could be of interest in the future. The different views demonstrated by the different stakeholders regarding the appropriate level of self-service BI would be an interesting topic for future research. Potential research questions for future research could be:

- What are the critical success factors for self-service BI?
- Does the context in which a company operate make a difference for what level of self-service that's appropriate?

Furthermore, the academic research regarding self-service BI is quite limited, which of course opens up an opportunity for academic contributions to be made.

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Appendix A: Interview guide

BI-suppliers and specialists/consultants

- Introduce yourself, what's your role?
- What's your definition of BI?
    - What's your mission in relation to BI?
- How has BI changed in the last two decades, and how do you think it will evolve in the future?
    - Is it used differently nowadays?
    - What are the challenges and opportunities?
- How do you analyze the market and user needs in relation to BI?
- What are the most important aspects to consider when selling or implementing a BI-solution and its associated visualization format?
    - What are the key selling points?
    - Is there a customer analysis process?
- Which are the most common questions or concerns from your customers?

    - What factors does your customers mention when discussing their data visualization?
    - Highly customizable BI, or highly standardized?

- How do you measure the efficiency of a particular BI-solution?

- In your opinion, what are the characteristics that define successful BI?

BI-users (companies)

- Introduce yourself, what's your role?

- What's your definition of BI?
    - How do you use it?

- Why do you visualize your data?
    - How does it help your organization?
    - Does it improve your decision making?

- Do you, and if yes, how do you measure the efficiency of your BI solution?
    - Do you in any way evaluate your BI? E.g. how users experience the data visualization, or how often they use it?

- What factors did you take into account when considering a BI-solution?
    - User experience, task characteristics? Complexity?
    - Highly customizable BI, or highly standardized?

- In your opinion, what are the characteristics that define successful BI?