

SELF-SERVICE BUSINESS INTELLIGENCE

– A STUDY ON THE SWEDISH MARKET

Bachelor's thesis in Informatics (15 credits)

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2016KANI13



UNIVERSITY
OF BORÅS

Title: Self-service business intelligence - a study on the Swedish market

Year: 2017

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Abstract

In a time where information is ever present and in large quantities, it becomes of extreme importance to organisations to find a way to store and analyse all this information in order to maintain their position on the market. One way to deal with this, which has been adopted by large company groups as well as smaller organisation, is the use of business intelligence, BI. This feature helps organisations to store and analyse information and provide analytical reports to support decision making. Despite the fact that BI has been around for a couple of decades it is still a rather new phenomena with a couple of problem areas which has been highlighted by several international studies and articles. Sweden as a market has been considered as somewhat of a pioneer when it comes to IT-development in general and early usage of business intelligence as well as the emerging trend in the business intelligence market; self-service BI. This solution aims to make business intelligence more user friendly in order to increase the amount of users and ease the pressure on IT-departments within organisations.

The purpose of this study is to identify these problems and investigate whether they can be applied to decision makers on the Swedish market and if self-service BI is affecting these problems. The study was done by using a survey with 46 respondents from different organisations located in Sweden. The result shows that the problem areas were not recognised by the majority of the respondents and there were correlations between user-friendliness and how often the respondents used self-service BI.

Keywords: Business intelligence, BI, self-service BI, self-service, SSBI, decision making.

Acknowledgements

We would like to thank our tutor Patrik Hedberg for his guidance and support during the process of this study. We would also like to thank everyone who participated in this study and answered the survey. At last but not least we would like to give a special thanks to Thomas Svahn for his time and helpful approach.

Table of Contents

1. INTRODUCTION	1
1.1. EARLIER RESEARCH.....	2
1.2. PROBLEM	3
1.3. PURPOSE AND RESEARCH QUESTION.....	5
1.4. LIMITATIONS.....	6
2. THEORETICAL FRAMEWORK	7
2.1. BUSINESS INTELLIGENCE.....	7
2.2. DECISION MAKING.....	8
2.3. USING BUSINESS INTELLIGENCE IN DECISION MAKING.....	9
2.4. USER FRIENDLINESS	10
2.5. SELF-SERVICE BUSINESS INTELLIGENCE	10
3. METHOD	12
3.1. RESEARCH APPROACH	12
3.2. NON EXPERIMENTAL DESIGN	13
3.3. DATA COLLECTION METHOD	13
3.3.1. Semi-structured interview.....	14
3.3.2. Sampling	15
3.3.3. Survey	16
3.4. DATA COLLECTION ANALYSIS	17
3.5. VALIDATION METHOD	18
3.5.1. External validity.....	18
3.5.2. Internal validity.....	19
3.6 ETHICAL CONSIDERATIONS.....	20
4. RESULTS	22
4.1. INFORMATION QUALITY AND QUANTITY.....	22
4.2. USING BUSINESS INTELLIGENCE IN DECISION MAKING.....	23
4.3. IT-KNOWLEDGE	24
4.4. USER FRIENDLINESS	26
4.5. SELF-SERVICE BUSINESS INTELLIGENCE	26
5. ANALYSIS AND DISCUSSION.....	29
5.1. ANALYSIS RQ1	29
5.1.1. Business intelligence information quality and quantity	29
5.1.2. Using business intelligence in decision making.....	29
5.1.3. IT-knowledge.....	30
5.1.4. User friendliness	30
5.1.5. Knowledge in self-service business intelligence.....	30
5.1.6. Summary RQ1	31
5.2. ANALYSIS RQ2	31
5.3. DISCUSSION RQ1	33
5.3.1. Business intelligence information quality and quantity	33
5.3.2. Using business intelligence in decision making.....	34
5.3.3. IT-knowledge.....	34
5.3.4. User Friendliness.....	35
5.3.5. Knowledge in self-service business intelligence.....	35
5.3.6. Summary	36
5.4. DISCUSSION RQ2	36
6. CONCLUSION AND REFLECTIONS	38
6.1. CONCLUSION.....	38
6.2. CONTRIBUTION.....	38

6.3. VALIDITY EVALUATION	39
6.3.1. Construct validity	39
6.3.2. Result validity	39
6.3.3. Generalisation	39
6.4. METHOD EVALUATION	39
6.5. METHOD REFLECTION	40
6.5. FURTHER RESEARCH.....	40
REFERENCES.....	42
APPENDIX.....	1

LIST OF FIGURES

- Figure 1. Decision making process.
- Figure 2. Results question 20-24 presented in percentage.
- Figure 3. Results question 24-28 presented in percentage.
- Figure 4. Results question 13-16 presented in percentage.
- Figure 5. Results question 8-10 presented in percentage.
- Figure 6. Results question 32,36-38 presented in percentage.
- Figure 7. Pie chart displaying the results of question 29:I occasionally produce BI-material myself.
- Figure 8. Pie chart displaying the results of question 31:I have access to the company's BI tools myself.
- Figure 9. Results question 30 and 32 presented in percentage.
- Figure 10. Results question 33 and 34 presented in percentage.
- Figure 11. Results question 35-38 presented in percentage.

LIST OF TABLES

- Table 1. Summary of results related to the stated problem areas and whether they are recognised or not.
- Table 2. Displaying the significant and strong correlations to question 29 and 31 found by using chi-square analysis.

1. Introduction

There has been a huge increase in the amount of available information to both businesses and society overall (Yee & Oh 2013; Butcher 1998). The increase has mostly been a result of the growing globalisation, and how the companies have been adapting new technology in order to stay competitive (Yee & Oh 2013). Improvements in information and communication technologies have led to a heavy impact on the amount of information. These technologies has revolutionised the collection, storage, organisation and delivery of information, and new tools to manipulate and process the information has been developed. In some industries these technologies have totally change the business itself (Butcher 1998). A company's information is one of its most valuable assets, and is mainly used for two purposes; operational record keeping and analytical decision making. In simple terms for putting data in using operational systems, and getting data out using business intelligence systems (Kimball & Ross 2013). Today's world's rapid transformation in globalisation, innovation, and competition creates a need for business intelligence (Sauter 2011), which is the highest priority technology item for CIOs (Lim, Chen & Chen 2013). Working with business intelligence, or "BI", requires both knowledge and experience, which applies on analysts as well as managers (Pagels-Fick 1999). Business intelligence has been around since the late 1980's, but since the breakthrough of big data analytics BI has been swamped together with this phenomenon according to an article by Progressive Digital Media Technology News (2016). They describe business intelligence as software applications that help organisations analyse their data.

The data that is being analysed is collected both from internal sources but as well from external sources. From the analysis, reports can be created with the help of dashboards, visualisation tools, in order to make them easy for the receiver to understand. Companies are using the material that is produced by the BI-function as support in decision making processes, and this is why BI is called a decision support function. BI is an active support function since initiative and commitment in decision projects plays a natural part in the business intelligence mission (Pagels-Fick 1999). According to Gartner Inc. (2016) the business intelligence and analytics market is forecasted to reach 16.9 billion dollars in 2016. This is an increase 5.2 percent since 2015. The goal with BI is to help managers make decisions that can solve problems or take advantage of opportunities. BI can provide the managers with information about the business in time to be able to make decisions and grasp the opportunities (Sauter 2011). The quality of a decision depends on the quality of the information that the decision is based on. A high effectiveness and efficiency in decision making is strongly related to how the company manage to get the most out of all their sources of knowledge (Evangelou & Karacapilidis 2006).

The main benefit of using a BI-system is to base decisions on data and analytic reports produced by the BI-system in order for the organisation to operate more efficiently and to get a comparative advantage versus market competitors. Different new market trends and problems can be identified with the help of a good BI-system (Progressive Digital Media Technology News 2016). As reported by Computer Sweden (Lindström 2013) the Swedish BI-market is growing around 10 percent per year, which is the fastest growing BI-market in Europe, and reached 1.1 billion SEK in 2012. There is no specific term for business intelligence in Swedish. Normally it is referred to as "BI" but Swedish terms that translates into "market and competitive intelligence" and "strategic business analysis" are also used (Pagels-Fick 1999). In this study the terms "business intelligence" and "BI" will be used in

order to avoid confusion. In an article in Computer Sweden, Danielsson (2016) describes how Sweden has been on top of IT maturity rankings through many years. However, he is now questioning Sweden's ranking since a majority of the Swedish IT-managers shows a lack of knowledge in the benefits of using IT in business development.

1.1. Earlier research

In times where business markets are ever changing it is of uttermost importance for companies to react to these changes and be able to make quick and innovative decisions. In order for companies to be able to make these decisions the need to access loads of data and information with the help of business intelligence as computerised support (Turban, Aronson, Liang & Sharda 2007). To further explain the importance of quick decision making they refer to a study made by CIO (Turban et al. 2007 see CIO 2006) where it shows that the ability to make clear decisions was rated as the most important ability amongst 6500 managers in over 100 different companies. BusinessWeek Research Services for Business Objects asked several hundred executives around the world about gut-based decisions and the survey showed that 3 percent did not use it at all, while 60 percent said that they used it in 50 percent of their decisions (Turban et al. 2007). In order to be able to make the best possible decisions in any given situation, managers need to be able to use the business intelligence systems that are provided and base their decisions upon the information retrieved from said systems. King (1997) talks about the paradox: we should, but we don't. This paradox is grounded in a theory that managers perceive business intelligence systems to be useful but they do not use them. The study shows that there are several factors why managers are not using their business intelligence systems frequently. Some of the factors mentioned were: time to learn the system, time to use the system, alternative sources, and information chauffeur. It also shows that potential users are using the systems because it is a more efficient way of gathering information rather than using it for increased effectiveness, which is what is desirable.

In Bortom Business Intelligence (Borking, Danielson, Ekenberg, Idefeldt & Larsson 2010), the authors further touch upon the relationship between decision making and business intelligence. It is believed that individuals consider themselves to be rational and able to make rational decisions but in fact, intuition is not always enough. Business intelligence helps with that but many projects that includes implementing and using business intelligence does not always reach the desired outcome. The authors describes some of these reasons and what can be done in order to improve the usage of business intelligence. Wieder and Ossimitz (2015) explains how organisations has been introduced to business intelligence in order to collect and analyse data from both internal and external sources, and therefore have had access to large quantities of data. With such amount of data they argue that it can be hard for organisations to filter out useful information that can be used in order to improve the quality of decision making. In Wieder and Ossimitz's (2015) study the impact of business intelligence on decision support and whether business intelligence improve the quality of managerial decision making is investigated.

According to Mesaros et al. (2016) commonly used information systems do not have the ability to react and handle upon large quantities of data stored in different databases within an organisation. The effect of this is that they cannot meet the need of the decision makers who rely on receiving relevant information in order to make correct and timely decisions. It is shown that companies who are able to implement business intelligence solutions in an effective and correct way should be able to make use of market opportunities in time to be

able to identify possible operational problems. Thus, the benefits should lead to competitive strength and enhance the overall organisational performance and competitiveness of business. It is not only the business performance benefits that are important factors when analysing whether a business intelligence system is rewarding. The need to evaluate individual employee performance is also an important factor to notice for the organisations. According to Hou (2012) it is considered by several researchers that end user satisfaction is a critical factor for the success when implementing as well as a leading factor in the usage of business intelligence and information system. However, this is something that has somewhat been overlooked when it comes to business intelligence systems.

Sweden as a market has been very innovative in the development of business intelligence; especially the banking community who were a huge pioneer in the mid 70's when they founded Upplysning Centralen, or UC Research in English, which is a BI research company. With the help of business agents posted on different locations around the world, the Swedish banks are able to access vital information from companies and individuals and also information provided by participating banks abroad. Business intelligence was not only used early by the banking community. Equally important was the Swedish government where information provided by business intelligence accounted for approximately 60 percent of the Swedish governments gathered intelligence during the 70's (Herring 1992). The author states that in order to receive success with the help of business intelligence both managers and practitioners are in need of professional education. One of the reasons that USA has not been as fast and efficient in adopting business intelligence and using it for competitive advantage is the lack of education and interest amongst senior managers. There were no universities in USA that provided education in business intelligence during the time of the article compared to Sweden where the world's first students with a Ph.D in the field of business intelligence were about to graduate.

The need for information and reports are growing in organisations as more and more departments make use of it in their daily activities. The IT-department is in charge of developing reports requested by for example the financial department, HR, and the production department. This often results in a huge amount of pressure on the IT-department and therefore creates delays before everyone get hold of their requested reports. One of the biggest trends and solution to these problems is the self-service solution to business intelligence which lets more people work with the business intelligence system (Svahn 2016; Schlesinger & Rahman 2015). In his article in Computer Sweden, Danielsson (2016) refers to a study by Arlington Research ordered by EMC which involved 2741 participants and 210 Swedish managers. The study showed that only 32 percent of the Swedish IT decision makers consider themselves to have the right skills, compared to for example 75 percent of the German and British IT decision makers.

1.2. Problem

There has been done a lot of research on business intelligence and the believed benefits that organisations can achieve by using these solutions (Butcher 1998; Pagels-Fick 1999; Sauter 2011; Progressive Digital Media Technology News 2016). It has been suggested that organisations will have an easier way of gathering, analysing and evaluating information in order to make quick, timely and effective decisions that will result in competitive advantage and more effective business processes. As it is with almost everything that has its pros, there will also be cons, downsides or problems. During the research of this report it has been

exposed that other scholars (King 1997; Borking et al. 2010) believe that organisations are willing to implement business intelligence solutions but that there are some doubts of the benefits and usage of these said solutions. The major problems, that has been mentioned previously, are that managers or decision makers are prone to use intuition when making decisions, or as Turban et al. (2007) states: gut-based decisions. In Bortom Business Intelligence (Borking et al. 2010) it is stated that there is a problem where decisions makers believe that they make rational decisions most of the time, but that it might not be the sole truth. Bachkirov (2015) and Dane and Pratt (2007) has also discussed upon the topics that emotions might lay as a reason for decision making in some cases. It is believed that some emotions, such as happiness, can result in decisions with a quick and heuristic character. For organisations that invest large amounts of both money and time on business intelligence solutions it is worrying that they may not be used to the fullest and that decisions still are based on feelings, emotions and intuition rather than on analyses made from gathered data.

Another problem that has been noticed by Wieder and Ossimitz (2015) and Mesaros et al. (2016), is the problem with organisations having access to too much information. The development of technology has led to an increase in the amount of information that both organisations and single individuals can get access to. Solutions such as big data and well developed information systems render in large quantities of information that organisations and their decision makers has to analyse and filter which information is important for every given situation. Wieder and Ossimitz (2015) notice that this can be a problem as organisations get access to not only large sums of external information but internal information as well. Hou (2012) states that in order to reach success in the implementation and usage of business intelligence systems, end user satisfaction is a factor that has to be taken into consideration. In the study by King (1997) it is believed that one of the reasons that decision makers are not using business intelligence system to the fullest is that they have access to an information chauffeur. If decision makers feel that they drown in too much information, which might not be a sign of high end user satisfaction. And in such cases, the decision makers feel that it is more convenient to receive information from another source, for example from an information chauffeur. This is a problem that has to be taken into consideration for this report. Not only can too much information in itself become a problem for organisations but the quality of the information as well. DeLone and McLean (2003) indicates that both information quality and end user satisfaction are factors for success and fellow researchers Mudzana and Maharaj (2015) believes that there is a relationship between these two factors as high information quality will result in high end user satisfaction. As these two problems seem to be connected, it is something that has to be considered in this research in order to understand the usage of business intelligence. Earlier in this study, it has been mentioned by Herring (1992) that Sweden is a country where both IT-knowledge, IT-maturity and IT-education has been on a high level. The author states that during the mid-90's Swedish students graduated in the field of business intelligence which can indicate that knowledge should been considered high amongst today's IT-managers. However, Danielsson (2016) states that there has been a decrease in terms of knowledge amongst Swedish IT-managers. Results from the study made by Arlington Research, that Danielsson refers to, shows that Sweden is falling behind when it comes to knowledge in IT decision making and how IT can help develop business. Although senior executives in Sweden appear to appreciate the value of BI, they do not use it themselves as much or as effectively as they should (Impagliazzo, Lundin & Wangler 2011).

Self-service BI, which is a huge trend in business intelligence, aims to satisfy organisations growing need for information and relieve the amount of pressure put on the IT-departments.

The knowledge required amongst self-service BI-users is not as immense compared to the IT-department but some basic knowledge is still needed (Danielsson 2016; Svahn 2016; Schlesinger & Rahman 2015). It is somewhat troublesome that Swedish companies are engaging in a trend which requires an increasing IT-knowledge amongst employees when research shows that Sweden, in fact, is falling behind in terms of IT-knowledge (Danielsson 2016). In an interview with Thomas Svahn, vice president at Advectas AB, he claims that self-service BI is not for everyone and most of the users that are not working in an IT-department are not suitable since they do not have the knowledge required to use self-service BI-tools properly. These unqualified users, such as managers working for example in the operational part of the company need easier ways to consume information according to Svahn. Svahn argues that in the hands of an unqualified user, self-service BI can easily result in making bad decisions based on for example analysing the wrong information.

Five problems can be argued to be the most common due to the fact that they are the ones that has been the most frequent in the research and literature that has been reviewed and conducted. The main problems that have been identified are as following:

- BI-users are suffering from the quantity and quality of the information provided to them.
- BI-users do not base their decisions on the BI material provided to them.
- There is a problem with the IT-knowledge level being too low amongst the BI-users.
- The users have a problem with the user friendliness of the BI-tools provided to them.
- BI-users are overall positive to self-service BI but do not have the knowledge needed to use it properly.

1.3. Purpose and research question

The purpose of this study is to identify how decision makers in Swedish organisations relate to the main problems when using business intelligence in decision making. The purpose is to determine if Sweden, as an IT mature market, differ from international markets when it comes to the main problems related to the usage of business intelligence. Furthermore the purpose is also to find out if the usage of self-service BI affects the experience of these main problems. This study aims to generate an understanding of the Swedish BI-users' attitudes towards the usage of BI in decision making in general, and towards the usage of self-service BI in particular.

The research questions that will be answered throughout this paper are:

RQ1: Do the decision makers in Swedish organisations experience the main theoretical problems with Business Intelligence as decision support?

RQ2: How is the use of self-service BI affecting the experience of these stated main problems?

1.4. Limitations

When doing research about organisations and their problems with business intelligence it could be interesting to widen the spectra and look at all sizes of organisations in different geographic regions. However, this study will focus on medium to large sized companies in Sweden. In this study the focus will lay on managers and their usage. However, one could look at all different individuals that come in contact with business intelligence in order to get a larger picture. The focus also lays on the major problems experienced by managers rather than the benefits of using business intelligence and this study will not go into technical details such as which solutions that are used by different companies.

2. Theoretical framework

2.1. Business intelligence

Business intelligence can be described as a set of tools that gathers data from different types of sources, external as well as internal. In order to help organisations improve their business processes the gathered data is transformed, through analytical tools as well as people, into knowledge. Most business intelligence systems are built upon different analytical tools such as: data warehouse, data mining, data visualisation and analysis, dashboard, scoreboard, information systems and so forth. The components may vary from solution to solution depending on what each solution are supporting and which type of information that is needed (Aruldoss, Travis & Venkatesan 2014). BI should be seen as a step in different processes in business development. Pagels-Fick (1999) describes in his book how the world is changing in an increasing pace and that this pushes the BI focus off the operational and more and more towards tactical short-term subjects. He states that external monitoring and analysis becomes increasingly important to understand the quickly changing structures, strategic positioning and behaviours of the different actors on the market. Business intelligence systems are considered by Pagels-Fick to be capable of leveraging a company's assets to optimise their value and provide a good return on investment. He also argues that these fast-changing times demand more innovative approaches to business systems. According to Thierauf (2001) the current increase of available data is useless without an effective way to access and synthesise vast amounts of information and knowledge. However, many companies take advantage of only a fraction of their data for strategic analysis.

In Bortom Business Intelligence (Borking et al. 2010) the authors further talks about the different applications of business intelligence, however they focus more on the functionality of business intelligence. The category functionally has been divided into four different sub-categories or four functions. These functions are as following; monitoring, performance management, analysis, and decision. Monitoring is the function where management are able to monitor the entire organisation in order to get a complete picture and thus be able to single out which parts that are functioning and the parts that are in need of further improvement. Performance management includes solutions and tools that help with creating result-oriented goals and the ability to follow up on these goals in order to see to what extent they are being reached. When something is not working properly within an organisation it is important to take a closer look at the specific part in order to find the reasons for the malfunction. The analysis function helps to provide sufficient data over a period of time that will help the user understand what and why something has gone wrong. The last function area, decision, will be described further down the text in a valid context to the report.

Business intelligence is a phenomenon with broad spectra and is believed to have a number of different benefits to organisations. Which benefits that are achieved by using business intelligence is looked upon by Elbashir, Collier & Davern (2008). The study reflects upon the believed statement that the effect on business process performance will be reflected on organisational performance. Furthermore, it is concluded that in such times where organisation invest large amount of money in business intelligence systems it is important to be able to measure the benefits and business value that comes with these investments. The authors also state that in order to measure the performance of business intelligence systems,

one can not only do an analyse on an organisational level or only at a business process level, as these two levels are related.

2.2. Decision making

For a long time during the history of decision making, it was considered as something that managers became good at through a long period of experience and intuition. Decision making was not based on information grounded in scientific research but rather in experience and different characteristics such as creativity, judgement and already mentioned intuition (Turban et al. 2007). The authors also refers to a decision making process that is considered to usually be used by managers. The process consists of four different steps: The first is to defining the problem, and the second is to constructing a model that describes the real-world problem. The third is to identify possible solutions to the modeled problem and evaluate the solutions, and the fourth and last step is to compare, choose, and recommend a potential solution to the problem.

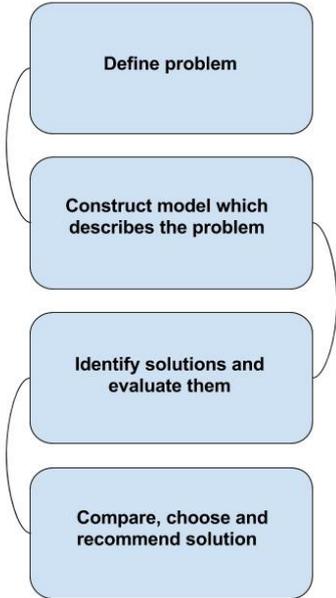


Figure 1. Decision making process.

In order to succeed with this process, the decision maker have to make sure that different solutions are being considered, that the outcome of using these alternatives can be predicted, and that a thorough comparison has been done. Turban et al. (2007) argues that this process is difficult to master due to different reasons. For example, technology such as search engines and information systems that provides large quantities of alternatives to choose from. In a time where the market and trends fluctuate all the time it is hard for managers to rely on experience and trial-and-error approach. Decisions need to be made quickly and effectively in order to maintain competitive advantage and avoid costs of making mistakes. Faced with a situation where a decision has to be made, it is important for managers to be aware of their emotions and the effect different emotions can have on the quality of decision making. Bachkirov (2015) studies the emotions anger, fear and happiness and what influence these have on judgement and decision making. The result of the study shows that while under the influence of happiness or anger, managers tend to approach a more quick and heuristic

decision-process. Fear, which is an uncertainty associated emotion, often leads to more detail-oriented process and an increase of information acquisitions. Another factor that involves information processing which differs from the path of logical and analytical thinking is the intuitive version of thinking process. One form of thinking process is the process that most people use in their everyday life, where decisions are based on experience and the ability to know without being conscious of it. Another form is process of purposely learn information in order to develop ideas and analysis, this process can be called rational decision making-model. Intuition is the process of how learned information and experience is accessed and used in order to make perceptions in an unconscious way (Dane & Pratt 2007). The authors describe intuition as the “heart” whereas the “head” is associated with rationality. The “heart” and intuition can be triggered by emotions and affect, such as a positive mood which has been discussed earlier. Emotions and affect can thus result in affect-laden judgements. Positive mood is an example where emotions can result in an increase in intuition rather than a rational approach and analysis.

2.3. Using business intelligence in decision making

Business intelligence systems move decision makers to the next level by providing them with a better understanding of a company’s operations so that they can outmanoeuvre competition, Thierauf (2001) writes in his book. Rouhani, Ashrafi, Ravasan & Afshari (2016) studied the benefits of using BI in decision making, and they found that BI has three main benefits; better knowledge processing, reduced decision time, and reduced decision cost. Turban et al. (2007) states that a well-functioning BI-system is the cornerstone of any organisation who wants a modern management. The authors describe several reasons for why BI-systems are vital when it comes to decision support, such as:

- Quick computations, which helps the decision maker to evaluate thousands of different alternatives.
- Improved communication and collaboration helps groups that are spread around the world, such as a supply chain, make decisions.
- Increased productivity of group members, which also improves the collaboration between group members at different location and can also increase the productivity amongst the staff. Improved data management helps with storing and transmitting different types of data (text, sound, graphics, video, foreign language) in a quick, economic, secure, and transparent way.
- Managing big data warehouses.
- Quality support and agility support which can help improve the quality of decisions to be made. When provided a large amount of data and knowledge, it can sometimes result in a limited problem-solving capability amongst individuals, which is called cognitive limits. BI-systems can help decision makers overcome cognitive limits in processing and storing information.
- Anywhere, anytime support is the last benefit explained as to why managers should use BI-systems as decision support.

It is important that those who are working with BI are on the right level relative to their individual qualifications. Self-awareness, knowledge, and understanding the company’s situation and potential is needed as a solid foundation, in order to be able to make relevant conclusions from BI material. A good judgement and ability to make assessments comes from

experience. The inexperienced analyst tends to present immense amounts of information to the decision makers. The analyst then expects the decision makers to familiarise themselves in the material as well as the analyst. However, this is not how it works. Instead the analyst, who is the most capable to interpret the analysis material, will draw conclusions and come up with a number of suggestions. This enables the decision makers to evaluate these interpretations and suggestions (Pagels-Fick 1999).

2.4. User friendliness

Hou (2012) argues that there are valid relations between high levels of end user computer satisfaction (EUCS) and improved individual performance when using business intelligence systems. The effect of this is that organisations, with business intelligence system with high user satisfaction, helped their employees to accomplish their tasks more effectively, improved their productivity and also the decision making quality. In order to reach user satisfaction there are, of course, a number of factors that has to be looked upon. According to the model for IS success contributed by DeLone and McLean (2003) there are six major factors that has to be taken into consideration: system quality, information quality, use, user satisfaction, individual impact and organisational impact. A study made by Mudzana and Maharaj (2015) indicates that there is a relationship between some of these mentioned factors for success. The authors argues that organisations who are able to reach high information quality will also score high on user satisfaction and also that high system quality will result in this outcome.

2.5. Self-service business intelligence

The recent years the demand of BI-report and pattern search has increased. This increased demand is on one hand driven by the new technologies, such as smartphones and social media and the new data that these technologies create and gather. On the other hand this development is driven by to extend of the usage of BI to not only include strategical questions but also operational matters. This extension of both the new types of data and the usage results in a higher pressure on the IT-department to produce BI-material for the business users (Alpar & Schulz 2016). Self-service BI can be applied in all sorts of industries and in many different functional areas according to Alpar and Schulz (2016). However, they argue that the concept is not yet widely spread within companies. Although the majority of data the integration tasks still is being performed by IT specialists, business users can through self-service BI at least partly execute an ETL-process (extract, transform and load) and data integration themselves. When additional data is made available in the self-service BI-system the business users should be enabled to perform an analysis of the data themselves. Such additional data could be for example imported external data or metadata.

In an episode of the podcast Digitaliserat (2016) Svahn argues that in order to prevent the self-service BI-trend from becoming a huge so called “shadow IT”, where the users are buying servers to be hidden under their desks, it is crucial that the IT-people are working with this development, reveal the issues and are welcoming the business users into the BI-family. The IT-department needs to still help the business users, maybe not build all the reports anymore, but still help the business users with guidance and support. According to Svahn the IT-department’s role is to stand up for data quality, IT security, information management and so on in this new BI-environment where the business users will create their own information contexts, BI-solutions but still in a small scale. The distributors are now presenting new tools and methods to the market, which creates opportunities for the business users to be more

involved in the process. Svahn explains that it is very important to create governance, like a playing field with certain rules, for the self-service BI-tools in each company to keep control of the quality of the outcome. Svahn also points out that it is important to find an organisational design, different user roles and regulations for the users to be able to use self-service BI in a secure and benefitting way. In the podcast he compares it to a football field where the players need to follow certain set rules, and as long as the players are following these rules they are allowed to move freely and do whatever they want on the field. Svahn thinks it should be the same way with BI and analytics since this enables the BI-talents to develop their skills and becoming a bigger asset to the company. This is not how most companies are working today which creates chaos and is not embracing the opportunities.

3. Method

3.1. Research approach

The research method that has been chosen for this study is a quantitative method. According to Cohen (1980) see Sukamolson (2007) a quantitative research can be defined as a research that applies empirical statements, which can be defined as a statement regarding what “is” the case in the “real world” rather than what “ought” to be the case. When doing a quantitative study, one aims to study a phenomenon that can be measured and that gathered data is analysed in order to find trends and relationships (Watson 2015). Using a quantitative study will enable the option to measure a large amount of decision makers and to find common trends amongst them. Robson (2011) describes that a post-positivist angle on a quantitative study allows the researcher's prior knowledge; values, theories and hypotheses influence the outcomes of the study. However, the goal is to be as objective as possible. The author also describes that the reality being studied can only be known imperfectly because of the researchers limitations. This statement let us be objective during the gathering of data whereas the result can be somewhat biased due to the limitations of our previous knowledge of this field. The theories about problems that has been found has been tested during this study to investigate if Swedish managers are experiencing the same problems, using BI, and if these problems differs from people who are using self-service BI. One of the easiest ways to gather data from a large amount of people in short amount of time is to use a survey-based method design (Robson 2011). With these characteristics of a quantitative study method that has been mentioned in this section, we believe that this method is the one that was the most suitable for us to answer our research questions in a proper way. In order to best test our research question and get the best possible result, we believe that in this case a quantitative method was superior to a qualitative one. According to Robson (2011), a qualitative method is applied to a study when the researcher wants to understand the meaning of reality along with the research participants. Blackstone (2012) further explains that the goal is to get an in-depth understanding from researching a small number of cases. This study's aim is to focus on getting a broad understanding rather than a deep. The focus of the research is on the “what” rather on the “why”. Blackstone (2012) explains that a quantitative method is to be preferred when breadth and focus on a large number of cases is desired.

During the study, two different and very common approaches to research has been adopted and used: inductive and deductive, explained by Blackstone (2012). An inductive approach to research means that the researcher collects data from the field that is going to be investigated. Once data has been collected, the researcher tries to find patterns and try to develop a theory based on these patterns. The inductive approach was implemented due to the fact that we wanted to collect data and then analyse the data in order to find any patterns that could form a problem statement followed by the research questions that we choose to use. Deductive approach is described as a method where the researcher has a theory and analyse data in order to see if the theory is supported or not. As a inductive approach had been successfully implemented in the data collection phase, a deductive approach was thus implemented when testing the patterns that were found with the help of our survey. The theory that was created with an inductive approach was tested with the use of a deductive approach. Blackstone (2012) states that these two methods often can be used together in order to reach a more complete understanding about the field of topic. The field of business intelligence is large and complex with a lot of information. This together with the statement above by Blackstone

(2012) are arguments to why an inductive and deductive approach was used as we wanted to combine these two approaches in order to reach as a complete understanding as possible.

3.2. Non experimental design

According to Thompson and Panacek (2007) the classification categories of research design includes experimental, quasi-experimental and non-experimental where the latter is the most heterogeneous and has many different designs. The non-experimental designs are mostly used when the purpose of the study is descriptive, rather than exploratory (Robson 2011) and therefore observational in their nature. The category of non-experimental design includes a broad range of different designs for different approaches and purposes (Thompson & Panacek 2007). The research that has been made in this study is directed at different Swedish companies and their employees in order to observe and describe whether they are experiencing problems when interacting with business intelligence. There is also the purpose of finding and measuring relationships between parties who are using self service and those who are not. Robson (2011) explains that non-experimental designs are most commonly used to measure relationship between different variables. With the research purpose and research question in regard, we believed that this approach and design has been the most suitable for this study as the aim is to measure relationships and to measure the results. This report followed the steps of Robson (2011) where it is stated that research question is to be formulated prior to data collection. Also that the decision of which data collection method and analysis method to use is also finalised, and this is to be kept throughout the entire study.

3.3. Data collection method

After the topic was chosen it was necessary to gain more knowledge about the field, its history, usage and which pros and cons that might be related to the field of business intelligence. Literature was collected from a variety of different sources and in different shapes as well. The majority of the literature was found using Summon, which is the online database of Högskolan Borås. Libraries were also used in order to complement online sources with actual books and magazines. The City Library of Gothenburg as well as the school library of Högskolan Borås was used. Some of the literature used was also conducted directly by using Google's search engine and the sources were carefully validated in order to secure the trustworthiness, this will be further touched upon later in this chapter. In order to find literature that would suit our cause certain areas and search words were used which included: BI, business intelligence, decision support, definition, history, benefits and problems of business intelligence, amongst other words and definitions. To find the proper literature in the libraries we investigated which areas of the library that could include proper material which was followed by collecting books, which we deemed interesting, to see if they could include any important material. One way of validating the sources without reading the entire material was to read the abstract, if presented, and based on that determine whether the source was suitable or not.

The literature that was conducted in the beginning of processes focused heavily on the history of BI and the usage. Knowledge about the history and development of BI was mostly conducted from literature such as books that were either conducted online or in a physical library. When getting an understanding of the usage of BI and in which fields of business it is most commonly adopted, the search for literature led us mostly to articles in different journals

as well as previous studies about the field. One huge benefit with reading previous studies was that they often include a somewhat generalised picture and explanation about the field of BI.

During the initial research about the field it was clear that there was a huge amount of different benefits that came with the adoption of business intelligence. This led up to the next stage where we started to look for patterns and problems within the field in order to be able to form a research problem. A lot of research such as previous studies indicated that there indeed are some problems with the usage of business intelligence. Previous studies were found about the impact business intelligence has on organisations (Rouhani, Ashrafi, Ravasan & Afshari 2016) and whether managers in decision making processes actually use the implemented solutions (King 1997). However, none of the studies we found included data collected from Swedish companies. The information that was found about Sweden and business intelligence was that Sweden was considered to be early adopters. Therefore we found it relevant to investigate what problems the Swedish manager's experience when using business intelligence. After the problem statement was designed, we felt that we needed further information about the Swedish business intelligence market. Thus we came to the conclusion to conduct a complementing pre-study using a semi-structured interview based on our previous findings.

3.3.1. Semi-structured interview

In order to complement the findings collected during the literature review it was decided to conduct an interview. There are different styles of interviews and we decided to do either an unstructured interview or semi-structured interview. According to Robson (2011) it is a challenging task for a novice to choose an unstructured interview and with very little prior experience we decided to go for a semi-structured interview. The semi-structured interview design is explained by Robson (2011) as a style that has large variation. The interviewer has a list of topics to receive responses on but it also gives the respondent a great deal of freedom to talk about the present topic. This type of interview is also considered to be widely used in multi-strategy design or as it is called in this study, mixed-method design (Robson 2011). Bell (2014) explains that a semi-structured interview can be a good compliment to a survey-based interview. The importance of formulating the question in a proper way for everyone to understand is not as vital in a semi-structured interview as it is in a survey. The language must, however, be understood by the interviewee, but the interviewers can explain and exemplify the question if any doubts occur. When the interview questions were designed we took the previous research we had collected into consideration, and used it as a base for what we wanted to ask the interviewee. The interview was designed according to the guidelines by Bell (2014) where it is explained that an interview should not include leading questions, preconceived notions, several question at a time, and value-based questions. Robson (2011) states that a semi-structured interview should include introductory comments followed by topic headings with matching key questions and closing comments at the end. With this in mind we designed our interview so that we had a list of question we wanted to have answered but with enough space and freedom to let the interviewee speak freely about these topics.

Semi-structured interviews can vary in the level of structure, from almost fully structured to very little structure (Robson 2011). Although our interview was somewhat structured it still gave the interviewee freedom. This type of design for the interview was considered to favour better answers than if we would use a more structured design due to the fact that the

knowledge of the person being interviewed is far greater than the knowledge we possess. Thus the risk of having vital information being left out was considered if the interview was too structured and giving very little freedom to the person being interviewed. The goal of the interview was not to answer our research question, but to add information and knowledge into further data collection. This also adds to the argument of giving the interviewee a lot of freedom.

3.3.2. Sampling

The aim, when choosing sampling design, was to reach a broad and representative sample of the population in combined with a rich collection of empirical data from experts. Since this study has a focus on using business intelligence in decision making, it was crucial to get in touch with actual BI-users. In order to achieve this criteria it was decided that a classic random sample was not suitable for this study and to contact the chosen participants to ensure they are using BI in some way in their decision making processes. The goal for the sample itself was decided to be around 50 people and to aim for a 50 percent response rate, thus to personally contact each participant was considered to be necessary but also time consuming. Therefore the study needed to have a high response rate to favour the odds for it to be conducted within the set time limit. In order to achieve all mentioned criteria it was decided that a probability sample was not suitable for this study since it is a lottery method which relies on blind chance according to Kothari (2004). Thus there was no documented list on every BI-user in Sweden that could be used for probability sampling, it was considered to be a big risk ending up with a very high amount of non BI-users if probability sampling was used.

A non-probability sample design was decided to be suitable for this study since Kothari (2014) explains it as a less time consuming and non-expensive sample design. However, the element of bias answers that he explains as a risk was taken into consideration and was prevented in the survey design and how the chosen participants were approached. For example the chosen participants were asked if they are using BI in some way in their work, and were not asked about self-service BI or anything specifically connected to the two research question in this study. Also they were not aware of the purpose of the study to prevent them for answering the survey in a bias way. When starting out we decided to contact people around us that we considered probably had some experience in using BI in decision making. The ones we contacted first were colleagues, relatives and acquaintances. These participants were considered as easy to access and to have a very high response rate. It was considered crucial to get a good start in order to reach the goal of around 50 competent participants. The ones who were considered qualified to participate in the study, when contacted to via phone, email or Facebook, were given the link to the online survey. They were also asked to send it forward to a couple of colleagues who they knew were using BI in their decision making as well. To complement this way of non-probability sampling we decided to contact other people in companies in several branches of industry who probably were using BI. Such as for example insurance companies, hospitals, banks, universities, and IT and communication companies. The goal was to reach a variation both in branch, company size, age, job position and gender. Therefore these parameters were considered when choosing which companies and people to approach. The same procedure was made with these chosen participants although it was predicted to take more effort to reach them, be harder to make them forward the survey, and to have a lower response rate. When people were considered not to be qualified, or when they themselves did not understand that they actually

were qualified, they were asked to refer us to a coworker who they thought were more suitable.

3.3.3. Survey

A survey method was used in order to retain answers on a high amount of standardised data from as many respondents as possible in a rather short period of time, as explained by Robson (2011). In order to reach success with a survey there are many factors that have to be taken into consideration. According to Robson (2011) the majority of all surveys include some type of questionnaire and there are different approaches to the way the questionnaire is administered, such as self-completion, face-to-face interview and telephone interview. The self-completion approach has historically been carried out by postal service but in recent years the internet has also been a forum where questionnaires reach their respondents. An internet-based self-completion questionnaire has the lowest cost to administer, the data collection period is short and the distribution range is high which means that one is able to reach a large number of respondents. Because of these reasons, the approach for this study is an internet based questionnaire that has been sent out to users of business intelligence at Swedish organisations. One of the disadvantages of an internet based questionnaire is that the response rate is considered to be rather low (Robson 2011), in order to somewhat prevent this calls were made beforehand so that the potential participants were aware of the questionnaire being sent. When designing the questionnaires for the survey we used the guides provided by Bell (2014) and Robson (2011). Both authors states that it is highly important that the questions in the survey are structured in a way that will result in a very low chance of misunderstandings. Bell (2014) states that there are seven different types of question where the survey used in this study focus mostly on category questions and scaling questions. The questions were structured as different statements where the respondent was given the option to choose how much they agree or disagree on a scale from 1-10. Bell (2014) describes this scale as the Likertscale and that it is used when trying to find out the intensity of one's attitude or feeling. The purpose of the survey was to investigate decision makers experienced problems with business intelligence and therefore we regarded this type of questions to be the best option. When designing the survey we used Bell (2014) and Robson (2011) as a guide to formulate our questions. Bell (2014) states a number of different aspects, such as vagueness and ambiguity, assumptions, memory, knowledge, double questions, leading questions, value based questions, hypothetical question and sensitive questions, which were thought of when designing the questions and statements. Robson (2011) states that an internet based survey should be short in order to retrieve the highest amount of answers. With this in regard, we designed our survey to not take more than five minutes to complete. The survey was designed using Google Forms, which is an application from Google for designing and conduct online surveys. This application was chosen because we believed that Google would be recognised as a trustworthy source and would minimise the risk of possible respondents regarding the survey as spam or advertisement. The survey was sent as a link to the respondents e-mail after been given approval to do so.

A suggestion by Robson (2011) is that a draft of the survey is being sent out and pre-tested informally. This pre-test can be sent to friends and family in order to get feedback on construction of questions and whether they are clear and simple. The second stage is that the survey is being pre-tested on the group of interest. The goal is to find out whether the respondent understands the meaning of the question and if any problems occur during the process of completing the survey. This process of pre-testing the survey is to be continued as

long as there are problems still coming back as feedback. When all the problems that occurred have been overcome, one can start sending out the survey to the actual respondents.

After we had designed our surveys we sent a pre-test to two friends in order to time how quick the survey was to complete and see if there were any major flaws. A second pre-test was also done, this time as an expert-based pre-test. The survey was sent to Thomas Svahn whom is considered to be in the group of interest for this study as he possesses a great amount of knowledge in the field of business intelligence. It was also sent to two others, one was a friend and one was a relative. The friend was chosen to pre-test the survey in order to prevent the participants to not understand the survey if they were not familiar with the actual BI-terms. This person has 10 years of managerial experience in different sales departments in medium large companies, although he was not familiar with the “BI” term. The relative was chosen to pre-test the survey since he has experience working with BI and is familiar to the terms. The three pre-test participants were asked to give feedback on the survey. The feedback they gave was taken into serious consideration and changes were made accordingly.

To begin with an introduction to the survey was added, which was requested from all three pre-test participants. This part describes to the participants who the target group is, how business intelligence as a term is used in the survey and what it includes examples of how BI can be used as decision support, and the purpose of the study. It also claims the amount of time the survey should take and that it is anonymous. Other alterations in the survey were changes to the design, rephrasing of some questions, and also shorten it down a little. Concerning the design it was changed to no longer include two separate parts in the end. Before the participant was only asked to answer one of the two last parts. Which part that the participant should answer was set by a previous question whether or not it occurs that the participant creates BI-support material oneself. These instructions were not noticed by the friend who answered both parts, but he noticed that some of the questions were very similar. When asked why he answered both parts, he said he might have been rushing a little and missed the instructions. Also he pointed out that the design is important and preferably to be changed since there is a risk that other participants would do the same and not notice the instructions. Therefore the design of the survey was changed to instead use an additional question directly after a previous “yes or no”-question, which the participant is only asked to answer depending on the answer on the previous question. This design was already used once in the pre-test survey and induced no negative feedback or misunderstandings by the pre-test participants.

3.4. Data collection analysis

Initially the analysis was focused on the main problems that are previously stated in part 1.3. The results from the survey was implemented into the analysing program SPSS in order to analyse the answers which had been retrieved from the participants. Once the answers have been implemented, all the questions were given their own labels in SPSS, so that each question could be recognised in the program and be given their own variable values. This was done according to the guidelines by Esaiasson, Gilljam, Oscarsson & Wängnerud (2003) of how to make a quantitative content analysis. Not only were the questions given their own labels but also a certain type which can be numeric or string, proper values and measurement which can be nominal or ordinal. The question were also changed so that instead of having a scale from 1-10, all the answers were changed so that answers 1-4 were in one group, 5-6 in another group and finally 7-10 in a third group. This was done in order to give a more complete picture of the different answers in order to better be able to analyse the different

answers. Esaiasson et al. (2003) describes that a quantitative content analysis is preferable when one wants to answer how often something occurs or how frequent different answers are. This was helpful to us as we wanted to see the frequencies of the different questions and statements of the questionnaire. The grouping of the answers made it easier for us to analyse whether people seemed to agree, disagree or stay neutral to the different questions and statements. The frequencies were translated into bar charts for further visuality.

Further analysis was done between different statements to see whether there existed any correlations. Usage of self-service BI was compared to statements regarding the problem areas to analyse whether there were any difference in the answers of those participants who use self-service BI and those who are not. The statements were put through a Pearson's chi-squared test which is included as a tool in SPSS. All the answers, which has been made into bar-charts to show frequency, together with the Pearson's chi-squared test were then observed and analysed together with the findings presented in the introduction and theoretical framework of this thesis in order to discuss potential resemblances and differences which would lead us to answer our research questions. Esaiasson et al. (2003) talks about different categories of content analysis and questions. One of the categories mentioned is the descriptive questions which touch upon resemblances and differences between variables. To analyse the different positions of the participants we chose to use a word cloud generator called TagCrowd to enable an overview of the results. After translating and coding the positions, in such way that very similar answers were combined to one, the answers were put into the word cloud generator.

3.5. Validation method

In order to evaluate the validity of the different sources that was used to establish the introduction and earlier research of this report there are different aspects that has been looked upon. According to Santa Cruz University of California [no date] there are three different aspects that needs to be considered then evaluating the sources being used. These three aspects are: Authority, Currency and Purpose.

3.5.1. External validity

Authority

Authority involves parameters such as who published the source and who the author(s) is, where the information in the source stems from and if it is trustworthy and well researched (Santa Cruz University of California [no date]). The majority of the articles, research papers, books and interviews that was conducted in this research was found using Summon which is a database provided by Högskolan Borås. The authority of the sources that was found was briefly investigated in order to conclude who the authors were and who was regarded as responsible

for the publications. Many of the research papers were published by other international universities and the authors were students within the field of research which we consider to be trustworthy sources. Published books gathered from both Summon and the physical library at Högskolan Borås. In order to determinate the authority of the books being used as sources we investigated whether the publisher seemed to be authentic or not and a whether there has been

previous editions of the books. We also used the fact that Högskolan Borås has chosen to make them available, as a component of trustworthiness. Many of the articles, research papers and published books that were used had parts where the authors cited primary sources. In such cases, the cited sources have been investigated as well to see if they are primary data and if they can be considered to be of good enough quality.

Currency

In the currency part, Santa Cruz University of California [no date] explains that the sources being used need to be checked for currency. This means that one needs to make sure when the source is published and whether the source is current for the topics being researched. IT is an area that is developing in a rapid rate and also ever changing. Because of this, we were very wary of using sources that could be old and out of date, with this said, not all sources that are considered old are necessarily out of date. When using sources that were of the older kind, we checked the information in them against sources more up to date in order to determine whether they were still valid to our topic.

Purpose

This area is discussed by Santa Cruz University of California [no date] as the purpose of the author. Whether the information is of the source can be viewed as fact, opinion or propaganda and whether the authors are objective and neutral and also if the authors are using emotion-roused language or could be interpreted as biased. The source that was being used which we had to evaluate the most was the interview we did with Thomas Svahn. Svahn can be considered as an expert in his field and we believed his intentions and interest in the subject to be true and real. However, Svahn as a professional is a sales person in his line of business which can result in that the information can be somewhat biased which was something we were aware of during the interview. Because of this, we asked as neutral questions as possible and cross-checked the information we received with previous information that we had conducted.

3.5.2. Internal validity

One of the most important and also one of the hardest challenges in empirical research is the validity (Esaiasson et al. 2003). The authors talk about two different definitions of validity where the first part is called construct validity and is defined by two factors: the congruity between the theoretical definition and operational definition and the absence of systematic errors as the second factor. The second definition of validity is named result validity by the authors. Result validity means that one is in fact researching what one states to research.

Construct Validity

To reach high construct validity one needs to have a theoretical definitions that can be translated into operational definitions (Esaiasson et al.). This means that the way of collecting data and asking questions needs to be aligned with what is being researched. The authors exemplify this with an example of researching power in municipality departments. In order to

research actual power, one cannot ask people who they believe has the most power because that would give an indication of believed power and not actual power. In order to reach a high level of construct validity in this research paper, these definitions were used and thought of when constructing theoretical definition followed by the operational definition. This research paper aims to investigate if the believed problems amongst decision makers in Sweden align with problems found in previous research. The answers that were received from the questionnaire showed whether the respondents considered themselves to be experiencing the problems or not. It was believed that the theoretical definition has been in good congruity with the operational definition and the way it was decided to collect the data. This has also resulted in that there are no recurring systematic errors as believed problems were the theoretical definition and believed problems were also the base for the operational definition.

Result validity

Result validity was mentioned previously as the validity that make sure that one is in fact researching what one has stated to research. Esaiasson et al. (2003) explains that two factors needs to be fulfilled. The first factor is construct validity which has already been explained as a strong correlation between theoretical definition and operational definition. The second factor that needs to be fulfilled in order to reach high result validity is called reliability by the authors. Reliability is explained by Esaiasson et al. (2003) as when there is an absence of random or unsystematic errors. These errors are explained to often occur in the phase of data collection or in the analysis process that follows and can be the result of faulty notes, misunderstandings or process errors when data is transferred into data files. If one is able to avoid such errors and have considerably high reliability combined with high level of construct validity it will result in high levels of result validity as well (Esaiasson et al. 2003). In order to reach as high result validity as possible it was made sure that there were no errors made during the implementation of the survey into the statistical analysis program SPSS which could have resulted in low scores of reliability. The answers from the survey were downloaded as an Excel file which was converted into SPSS without any data being interfered with. Once all the data was transferred into SPSS all the different variables were given proper names along with the entire question implemented as a descriptive label in order to avoid any misinterpretations during the investigation of the results.

3.6 Ethical considerations

According to Bryman and Bell (2011) there are four different principles that have been followed when designing interview and survey for this study.

- Harm to participants
- Lack of informed consent
- Invasion of privacy
- Deception

Harm to participants includes different aspects such as physical harm, harm that affects the participants self-esteem, harm that can jeopardise the participant's career possibilities and future employment. To make sure that no harm to participants was made, every participant was offered total anonymity, neither name of the participants or name of the organisation was

required. The second principle, lack of informed consent, means that the participant should receive enough information about the study in order to make a decision on whether they want to participate or not. To cover this principle, participants were informed via telephone where the subject was explained and information was presented. There was also a short introduction that explained what the survey and study was about in the beginning of the questionnaire. Every participant was also given the opportunity to decline and no surveys were sent to those who wished not to participate. The third principle, invasion of privacy, means that the integrity of the participant should be cared for which includes that there are no sensitive questions which require the participant to reveal sensitive or private information. There were no sensitive or private questions in the survey in order to make sure that the participants privacy were not invaded. The only questions which can be considered to be private were age and gender but it was not believed to be of any issue to the participants. The fourth and last principle is about deception and whether the researchers are being honest about the research towards the participants. This was also avoided due to the fact that the participants were informed about the aim and purpose of the study beforehand.

4. Results

The positions of the respondents and which departments which they work within differs a lot and there are little or no clusters with any real significance. The two departments who stands out from the rest with a small margin is sales & service together with production. In the first part of this chapter, the results of whether the respondents experienced the problem areas will be presented together with related diagrams to give the reader a more complete and cohesive picture. As previously mentioned, the design of the questionnaire was structured in a way that gave the respondents the option to answer on a scale from 1 to 10 on whether they agreed or disagreed to the different questions and statements. 1 on the scale equaled total disagreement and thus 10 equaled total agreement. In order to get a better overview of the results from the questionnaire we decided to group the respondents into three different groups for every question or statement. The groups were structured as respondents who disagreed, respondents who were considered to be neutral to the question or statement, and those respondents who agreed. Those respondents who scored 1-4 were put in the first group, 5-6 in the neutral group and 7-10 in the group which agreed with the statement.

4.1. Information quality and quantity

In this section of this chapter, the results regarding whether the respondents experience the problem areas that has been discussed in previous section of this research papers. The main problems that has been discussed is the problems of decision makers having too much information and finding it difficult to analyse and filter out useful information from these huge quantities, the problem of BI-systems being too hard to use and not user friendly enough combined with a lack of knowledge amongst the users of these systems. The problem of people being too intuitive and acting on experience and prior knowledge rather than actual data from the BI-systems when making decisions has also been discussed and thus investigated. The questionnaire included different areas which focused on the different problems that were investigated. The problem of decision makers having too much information and having problem with filtering this information was concentrated into three different statements which the respondents could choose to agree or disagree with.

82.6 percent of the respondents believed that the BI-reports they had provided to them were reliable and 8.7 percent of the respondents who believed that the information provided was insufficient whereas 60.9 percent believed it to be sufficient and the rest 30.4 percent were neutral. To the questions regarding information overflow and filtering it was regarded as problems to 17.4 percent of the respondents to the second question and 26.1 percent on question number 23.

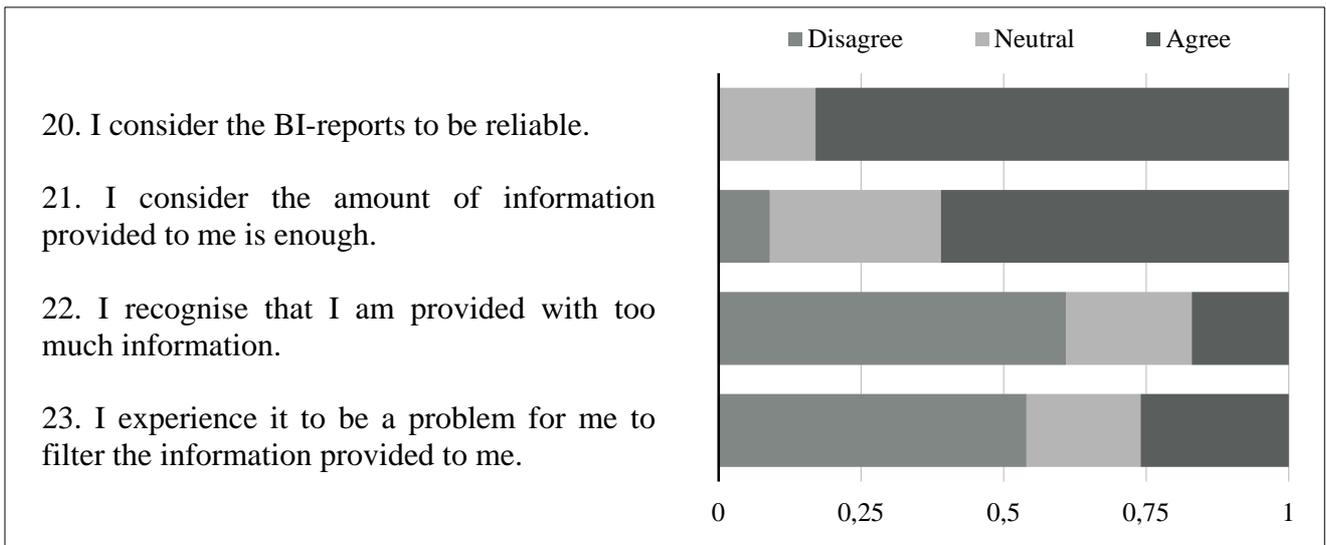


Figure 2. Results question 20-24 presented in percentage.

4.2. Using business intelligence in decision making

Decision making has previously been discussed as a problem due to the fact that several literatures shows that individuals can be prone to base decision on intuition and so called “gut-feeling” rather than base decision upon reliable facts. It has been discussed that these believed factors for decision making may result in organisation who has invested huge capital into implementing BI-system will watch them being unused. The questionnaire has been divided into different section that involves statements touching upon the decision making in general such as how confident the respondents are to make decision and whether they base decisions on prior experience (Figure 3). The second section involves the perception towards BI-systems and the importance of having a BI-system as a support for decision making (Figure 3). The results shows that 80.4 percent of the respondents feel secure in making decisions, 89.1 percent that their decisions are of high quality, 76,1 that they have sufficient knowledge to make decisions and 73.9 percent of the respondents make decisions based on their experience.

The results regarding the respondent's feelings towards BI as a decision support shows that there is majority which agrees to the statements that BI is important to the company in general and to the company's decision making. It also shows that the respondents believe that BI is an important part of their daily work and that BI helps them to feel secure in their decisions, to make decisions of high quality and to make quick decisions. However, the answers of whether the respondents base their decisions on reports generated from a BI-system as well as whether they believed that there was a long waiting time to receive these reports were a bit scattered as 39.1 percent agreed with the statement, 41.3 percent neither agreed nor disagreed and 19.6 percent disagreed with the first statement and on the second statement 41.3 percent agreed, 34.8 percent neither agreed nor disagreed and 23.9 percent agreed.

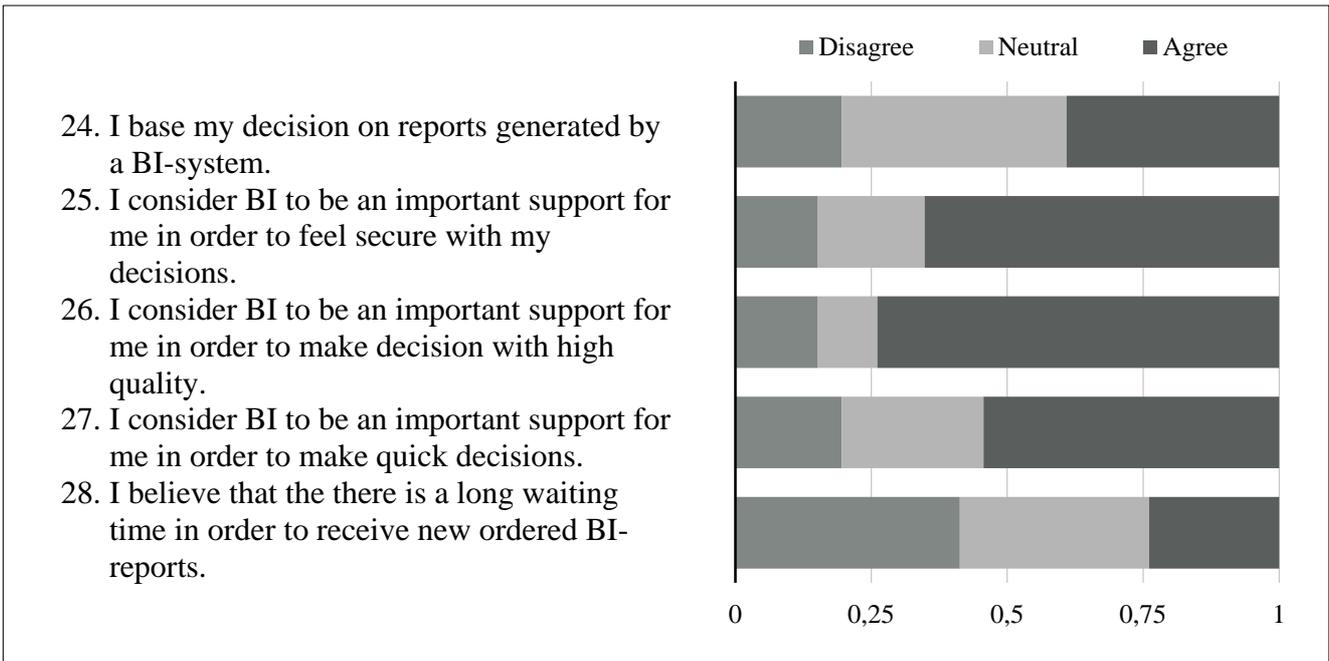


Figure 3. Results question 24-28 presented in percentage.

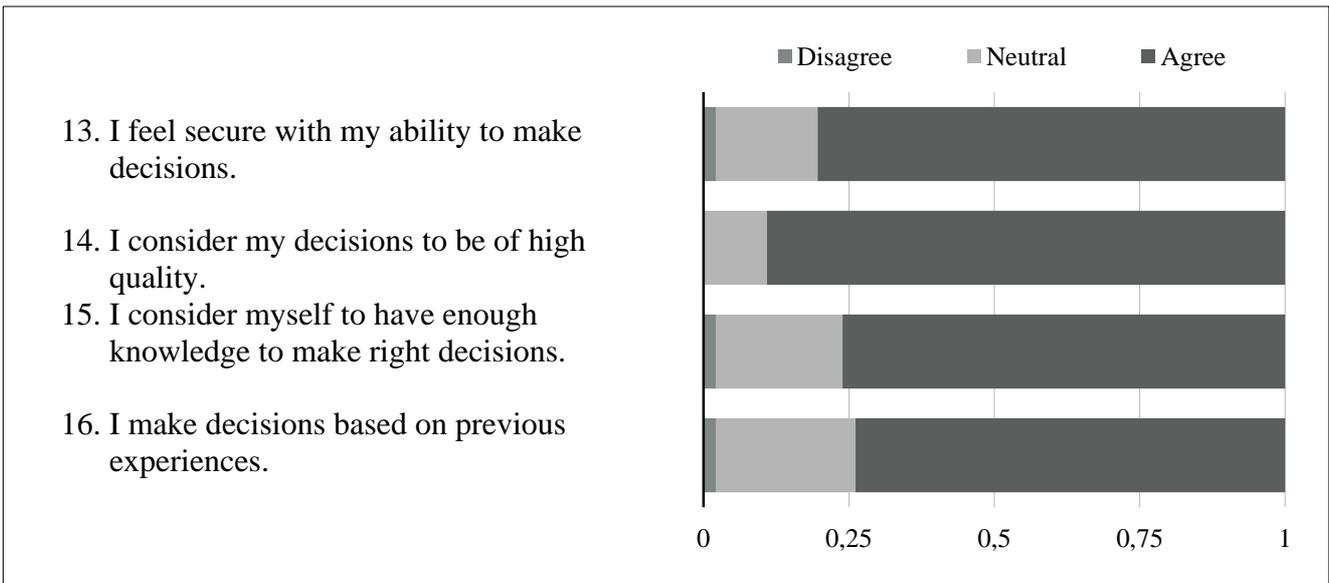


Figure 4. Results question 13-16 presented in percentage.

4.3. IT-Knowledge

In this section the results of the problems regarding knowledge amongst BI-users will be presented. Knowledge, or the rather, the lack of knowledge amongst Swedish managers and on the Swedish market overall has been shown to be a problem and has been mentioned previously in this report. The interpreted IT-knowledge were therefore investigated by asking the respondents how they would rate their own IT-knowledge and whether they believe they have enough knowledge to use the BI-systems that they come in contact with. Another problem connected to knowledge that has been mentioned in this study is the problem of BI-

system not being user friendly enough which may result in a lack of usage from managers who will look elsewhere for information to support their decisions.

The statements that were used to investigate the knowledge and the believed user friendliness of the systems and the results from these statements will be presented. Questions 8, 9 and 10 were asked in order to understand on which IT-skill level the respondents believed themselves to be on and to see whether there were any difference compared to questions 32 and 36. Questions 37 and 38 were asked in order to investigate whether the respondents feel that they receive enough supports from their employee and if that in some way correlated with a lack of knowledge and if there could be any correlation with question 38. The results from the questions show that 47.8 percent of the respondents believed themselves to have good skills in Excel and 43.4 percent to have medium skills. 8.7 percent of the respondents believed themselves to have good skills in database management compared to 58.7 percent who believed themselves to have low skills. However, on the question regarding general IT-knowledge 76.1 percent of the respondents believed their IT-knowledge to be on a high level and 21.7 percent to have a medium skill level.



Figure 5. Results question 8-10 presented in percentage.

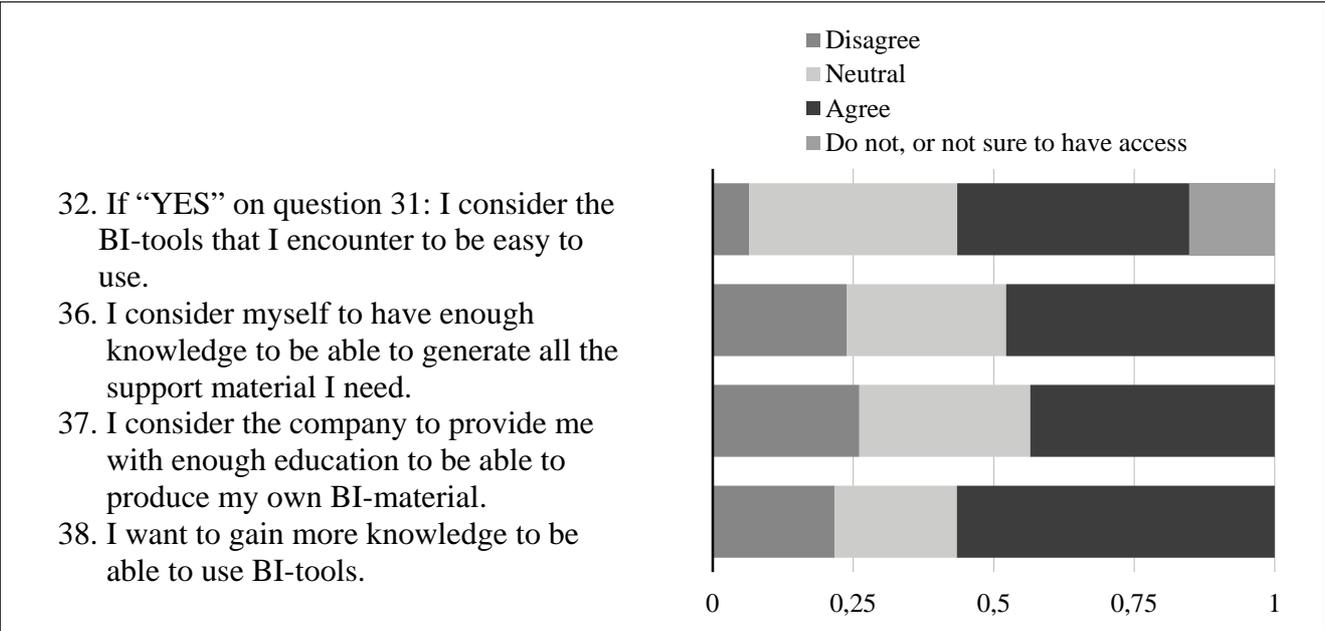


Figure 6. Results question 32, 36-38 presented in percentage.

47.8 percent of the respondents believed themselves to have enough knowledge to generate their own reports and 43.5 percent believed that their company provided enough education for them to do so. Although 56.5 percent of the respondents agreed to the statement that they want to gain more knowledge in order to use BI-tools (Figure 6).

4.4. User friendliness

To investigate whether the respondents feel that the systems they use are believed to be user friendly the statement “I consider the BI-tools that I encounter is easy to use.” was used. As can be seen in Figure 9, 7.7 percent of the respondents disagreed with this statement and 48.7 percent believed that the BI-tools they come in contact with are easy to use (Figure 9). It was also tested if there was any difference between respondents who used self-service BI and those who did not.

4.5. Self-service business intelligence

When it comes to Self Service BI 73.9 percent of the participants answered that they occasionally produce BI-material themselves and 26.1 percent of them answered that they do not (Figure 7). Out of the 34 participants that answered that it happens that they produce their own BI-material 44.7 percent agrees that the BI-material they are using is most often generated by themselves. The result in this study shows that 31.6 percent are not frequently using BI-material generated by themselves and 23.7 percent remains neutral (Figure 9). 82.6 percent of the participants in this study have access to the BI-tools themselves. 10.9 percent responded that they are not aware if they are qualified to have access to the company’s BI-tools or not and 6.5 percent replied that they do not have access themselves (Figure 8). Out of the 38 participants that answered that they have access to the company’s BI-tools themselves, 48.7 percent consider the BI-tools they encounter to be easy to use. 7.7 percent of them disagree and 43.6 percent are neutral.

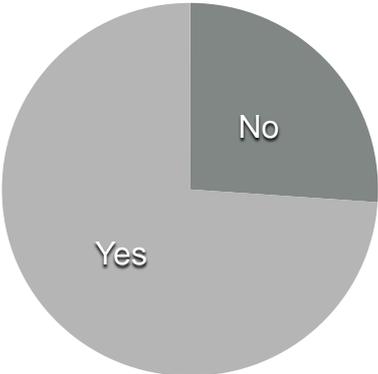


Figure 7. Pie chart displaying the results of question 29: “I occasionally produce BI-material myself”.

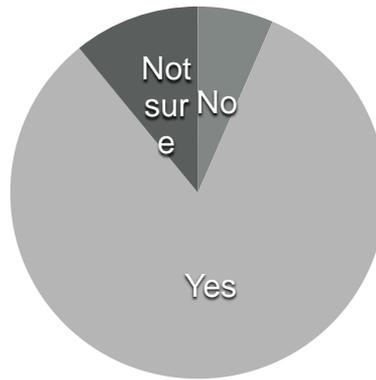


Figure 8. Pie chart displaying the results of question 31: "I have access to the BI-material myself".

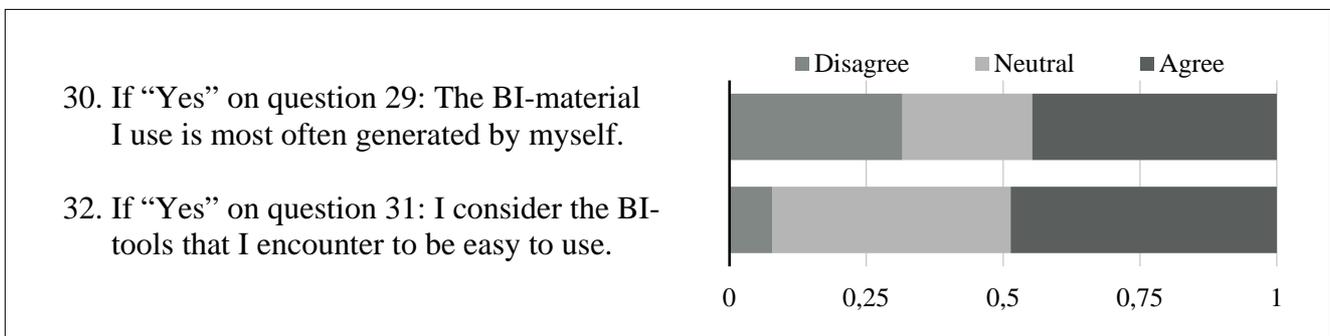


Figure 9. Results question 30 and 32 presented in percentage.

56.5 percent of all the 47 participants agrees that they consider it to favour their daily work if they are able to produce BI-material themselves. 17.4 percent disagrees with this statement and 26.1 percent remains neutral. To statement number 32 "I consider producing my own-BI-material to be important." 67.4 percent of the participants agrees and 13 percent disagrees.

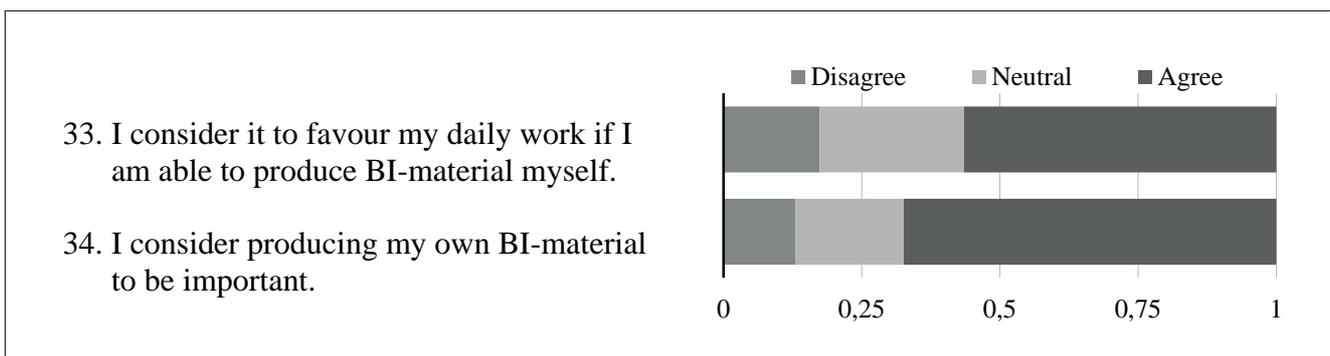


Figure 10. Results question 33 and 34 presented in percentage.

In this study 58.7 percent consider it to be a task of their assignment to produce BI-material themselves, while 19.6 percent disagrees. 47.8 percent of the participants consider themselves to have enough knowledge to be able to generate all the support material they need, while 23.9 percent do not. 43.5 percent agrees that they consider the company to provide them with enough education to be able to produce their own BI-material, while 26.1 percent disagrees.

To the last statement which is “*I want to gain more knowledge to be able to use BI-tools.*” 56.5 percent of the participants agree and 21.7 percent disagrees.

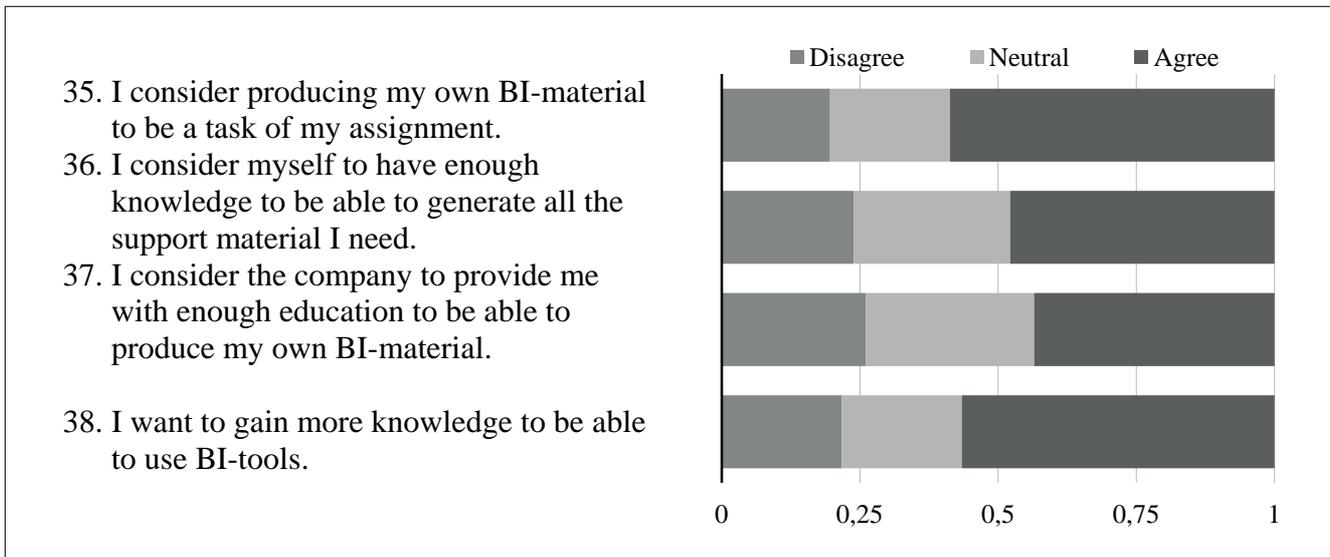


Figure 11. Results question 35-38 presented in percentage.

5. Analysis and Discussion

In this part of the study the results from the questionnaire will be observed and analysed in two parts, one part for each research question. The structure of this part is similar to the results part of the thesis since each problem is divided into different paragraphs and treated separately in order to make it easier for the reader to follow. Also the two research questions are treated separately to divide the analysis of the stated problems from the analysis of how self-service BI affects the experience of the stated problems. This part works as a foundation for what will further be discussed in the next part of this chapter.

There was a wide range of different positions amongst the respondents which can be analysed as a result of the fact that different organisations may have different names for positions who in fact are very similar to each other. Also the fact that in the questionnaire, the respondents were given the option to fill in their position rather than choosing from existing alternatives may have affected the huge spread.

5.1. Analysis RQ1

5.1.1. Business intelligence information quality and quantity

In order to answer the question whether the participants recognise the problems that involve getting information that is not considered reliable, getting too much information and having a problem with filtering the information in order to find useful data, the results from these questions have to be analysed. These results are taken from questions 20,21,22,23, which can be seen in Figure 1. From these results it shows that the majority of the participants does not agree with the problem of having too much information nor agree to have a problem with filter the information provided to them. Information is considered to be reliable, the information is enough and to filter the information provided is not considered an issue. With this in mind together with previous findings stated in this paper, one can strongly argue that the majority of the participants does not recognise these problems to be an existing factor for them and that these problems do not apply to them.

5.1.2. Using business intelligence in decision making

The answers from the questions which are touching upon the problems that are related to business intelligence in relationship with decision making will be analysed in this section. The questions that touch upon this subject are questions from two different sections. Questions 24-28 are questions regarding the importance of business intelligence as decision support, waiting time and whether the participants base their decisions on business intelligence reports (Figure 2). From these answers it is very clear that many of the respondents feel that business intelligence is something that is considered to be important to them for several different reasons. It is important support for quick and high-quality decisions that they can feel secure with. However, a vast majority of the respondents does not base their decisions upon reports from business intelligence even though it is considered to be an important support. By looking at Question 28 "I believe that there is a long waiting time in order to receive new ordered BI-reports.", it shows that this is not something which is considered to be a problem by a large

number of the respondents and thus cannot be used as an argument to why the respondents do not base their decision upon BI-reports. By looking at the second section for this problem area, Questions 13-16 (Figure 3), it can be seen that the respondents are very confident in their own ability to make decisions. It can be argued that these answers are the reason to why BI-reports are not used frequently as decision support because the respondents believe their own ability together with previous experiences to be superior to the reports provided by business intelligence. The reliability of the reports should not be considered as a reason for the lack of usage as well, as the majority of the respondents believed the reports to be reliable as stated above.

5.1.3. IT-knowledge

General IT-knowledge and IT-knowledge connected to business intelligence will be analysed in this section. A closer look at question 8-10 (Figure 4), has to be made in order to analyse the general IT-knowledge amongst the respondents. As can be seen, a large majority of the respondents believe themselves to have IT-knowledge that can be considered high. However, with a quick glance at questions 9 and 10 it can quickly be determined that these answers does not have the same majority of respondents with believed high knowledge. If these three questions are put against each other it can be argued that the respondents does not possess such a high level of IT-knowledge as they claim, or rather as they believe. One can argue that considerably high IT-knowledge should contain high levels of knowledge in some kind of database management and to at least have medium knowledge. However, the majority of the respondents have answered that their knowledge in database management is low. Looking at questions 36-38 (Figure 5), it is clear the majority of respondents to not believe themselves to have enough knowledge to provide their own BI-reports and that sufficient education is not provided to them even though the majority wants to gain more knowledge in the field. These questions together with questions 8-10 adds to the argument that the respondents do not possess enough IT-knowledge to be able to use the business intelligence tools provided to them. This argument can also be one of the reasons for the lack of usage which was discussed in previous section.

5.1.4. User friendliness

Question 32 (Figure 5), is used to analyse whether the respondents believe that the business intelligence systems they encounter are user friendly. The answers shows that a big part of the respondents believe that the systems are easy to use and an almost equal amount are left neutral to the question. This leaves a very small group who believes that the systems they encounter are hard to use. From these answers it can be argued that the business intelligence systems that the majority of the respondents encounter can be considered to be user friendly. I can therefore also be argued that issues with user friendliness is not something that can be considered to be a problem to the majority of the respondents and not something which should hinder them from using the business intelligence systems provided.

5.1.5. Knowledge in self-service business intelligence

This section is similar to the one about IT-knowledge but in this part self-service BI will also be a factor considered in the analysis. As can be seen in Figure 6, there is a rather large part of

the respondents who practises self-service BI to produce their own business intelligence reports all most half of them consider themselves to be frequent users. However, almost 50 percent of the respondents who uses self-service BI, believe that they do not have enough knowledge to maximise the usage of business intelligence. The analysis that can be made from this is that self-service BI is meant to involve more users into business intelligence but the fact remains that the users still need considerable knowledge to be able to fully maximise it.

5.1.6. Summary RQ1

A summary of the analysis of the different sections can be seen in Table 1. The table shows the different problem areas that have been mentioned in this paper. It also shows the results that can be drawn from analysing the results which means that it does not only show the results of the exact opinions of the respondents. This means that the purpose of the table is to shows the results that has been drawn from the responses and which had been argued for in these previous sections of this chapter. For example, the respondents do not believe IT-knowledge to be a problem but with the different results regarding knowledge it has been argued to IT-knowledge can still be recognised as a problem amongst the respondents.

The problems found in the literature and previous studies	Recognized	Neutral	Opposite result
Users are suffering from the quantity and quality of the information provided			X
Users do not base their decisions on the BI-material	X		
There is a problem with IT-knowledge amongst the users	X		
The users have a problem with the user friendliness of the BI-tools provided			X
Users are overall positive to self-service BI but do not have the knowledge needed to use it properly	X		

Table 1. Summary of results related to the stated problem areas and whether they are recognised or not.

5.2. Analysis RQ2

To be able to find any correlations between the usage of self-service BI and the main problems, a chi-square analysis method was used in this study. The following statements “I occasionally produce BI-material myself” and “If so, the BI-material I use is most often generated by myself” was chosen to be analysed since they both relate to the usage of self-service BI. The results of these two statements were used in the chi-square analysis and were compared to all the other results from the other statements and questions in the survey.

When analysing the result of the chi-square tests following correlations were found:

	Significant	Strong
29. Occasionally I produce BI-material myself.	34. I consider producing my own BI-material to be important.	33.I consider it to favour my daily work if I am able to produce my own BI-material myself. 35. I consider producing my own BI-material to be a part of my task assignment.
30. If “YES” on question 29: The BI-material I use is most often generated by myself.	10. I consider my knowledge in database management (such as SQL) to be: 32. If “YES” on question 31: I consider the BI-tools that I encounter to be easy to use. 33. I consider it to favour my daily work if I am able to produce BI-material myself.	

Table 2. Displaying the significant and strong correlations to question 29 and 31 found by using chi-square analysis.

The strongest correlations that appeared were that participants, who occasionally produce BI-material themselves, also consider it to favour their daily work if they are able to produce BI-material themselves. Also the participants considered producing their own BI-material to be a task of their assignment. Both these correlations were considered to be strong. A significant correlation, but not as strong as the previous two, was that the participants also considered producing their own BI-material to be important. Considering the participants who most often use BI-material generated by themselves three correlations were found. None of them was considered to be strong but still significant enough. The correlations were that these participants consider themselves to have an medium or high knowledge in database management, for example knowledge in SQL, and that they consider the BI-tools they are practicing to be easy to use. Also these participants consider it to favour their daily work if they are able to produce their own BI-material themselves, but the correlation was not as strong as to the previous question (Table 2).

Just because the respondents do not believe the problems to exist does not mean that they in fact is non-existing amongst organisations. The respondents answers are to be considered as sources and should therefore be treated with the same source criticism as other sources (Esaiasson et al 2003). There could be argued that there is a tendency amongst people to answer less truthfully when it comes to their own experience in order to paint a better picture of themselves. It can also be discussed that there might exist other problems besides the ones that were investigated in this study. The questionnaire only contained a small number of specific problems and left no room for the respondents to answer whether they experienced some other problems which was not mentioned.

5.3. Discussion RQ1

5.3.1. Business intelligence information quality and quantity

If decision makers feel that they drown in too much information that might not be a sign of high end user satisfaction (King 1997). Not only can too much information in itself become a problem for organisations but the quality of the information is also a determining factor (DeLone & McLean 2003; King 1997). There is not a problem with reliability in the BI-material used by the participants. The information given from BI-tools appears to be widely trusted. A majority of the participants in this study do not experience a problem with the amount of BI-related information they receive. This means that they feel that they receive enough information to be able to make decisions and also that they do not suffer from getting too much information. This result contradicts previously mentioned international studies. Although, it is more common to experience a problem to sift the information given, than to experience to not been given enough or too much information. Even though the majority is not experiencing this problem, more participants agree with experiencing this problem compared to the previous stated problems regarding the amount of received information. One could argue that this is a sign of our time. Internet and global connection results in almost everyone being presented to huge loads of information everyday and during several hours throughout the day. This may result in the fact that people are very used to the fact of being influenced by information and therefore feel that they have no problem with the amount of information they receive from a BI-system. According to a study made by University of San Diego (UC San Diego News Center 2009) the average human brain of the American population consumes 34 GB of information everyday and this amount has grown with 350 percent since 1980 and according to an article by Richard Alleyne (2011) states that we receive five times as much information now as we did in 1986. This adds to the argument that because people consume more information now they are more used to information in general. If it is true that people, nowadays, are able and used to process large amounts of information it can be argued that information overflow is not a problem amongst business intelligence users. However, it can also be an effect of the quality and structure of the information today being superior than before, and therefore less complicated to process.

5.3.2. Using business intelligence in decision making

In the theoretical framework of this study several discussions about decision making in general and connected to BI have been presented. The case that has been made as a part of the framework for this study is that there are some problem areas connected with the way individuals behave when facing decisions and that BI is a system designed to help individuals with their decisions. Intuition and irrationality is two problems that has been discussed (Borking et al. 2010; Turban et al. 2007) together with the fact that managers want to use BI as a decision support but they, in fact, do not (King 1997). The result from the questionnaire shows that the majority of the respondents consider themselves to be confident in their decisions. It also shows that they consider themselves to have enough knowledge. They also consider the decisions they make to be both of high quality and also made on previous experience. The results also shows that the majority of the respondents has a positive attitude towards BI and views it as an important support for them to make quick decisions with high

quality that they feel secure with. Despite this positive attitude towards BI as decision support only 39 percent of the respondents agreed to the statement that they base their decisions on reports generated by a BI-system. This result is in line with the findings done by King (1997). The majority of the respondents are positive to BI but they do not feel that they are using BI as a support when making decisions. Even though King's (1997) study is almost 20 years old, the problem statement can still be considered as relevant. The findings of this study can be compared to the findings of Impagliazzo, Lundin and Wangler (2011) where it is stated that Swedish senior managers do not use BI as much or as effectively as they should. With the results from the survey together with the literature it can be discussed that business intelligence is not used to its full potential amongst organisation and its employees. The reasons for this can be that people in general are very secure in their own ability to make decisions and that there is no difference when it comes to making business decisions. It should also be mentioned that there is a possibility that people are making decisions based on the support of business intelligence subconsciously and therefore does not recognise that they have been influenced by business intelligence. It can also be discussed that organisations who have standards and routines for decision making and using business intelligence as decision support face greater chances to be successful. However, people do believe business intelligence to be an important support but does not use it to its full potential or as frequent as desired.

5.3.3. IT-knowledge

According to King (1997) one of the factors for usage of a BI-system is that the user possesses enough knowledge to actually use the system. Knowledge in the field of IT has been on a high level in Sweden and Sweden as a market has been very mature when it comes to usage of BI (Herring 1992). However, studies show that there has been a decrease in terms of knowledge amongst Swedish IT-managers (Danielsson 2016). Based on the results of this study the Swedish BI-users believe themselves to have rather high knowledge in IT and also that the knowledge they possess is enough to do their work tasks. However, the answers are only the opinions of the respondents and cannot be put into comparison with the knowledge of fellow colleagues from other countries but a comparison can be made with the study made by Arlington Research where only 32 percent of the Swedish IT-managers believed themselves to have the right skills. A reason for this can be that the questionnaire only contained three respondents from an IT-department where the need of IT-knowledge is on a higher level. The BI-users in other departments may have work tasks which require IT-knowledge on a lower level compared to the respondents of the Arlington Research. One can argue that the Swedish BI-users will therefore have IT-knowledge sufficient enough to complete their task and therefore consider themselves to have high IT-knowledge overall. It can also be argued that IT-knowledge amongst managers in IT-department is still lower compared to other countries but that the overall IT-knowledge amongst Swedish organisations is in fact at a rather high level. On the other hand, based on this study the majority of the Swedish BI-users believe themselves to have considerable high IT-knowledge. However, when taking a look at the answers on the questions about knowledge in Excel and database management it shows that there are fewer respondents with considered high knowledge in these areas. This could be viewed as that the respondents does not possess such a high level of IT-knowledge as they believe. This could in fact align with the statements of Danielsson (2016) that Sweden it falling behind when it comes to IT-knowledge. Based on this it can be discussed that it is important for organisation with business intelligence to make sure that the employees who comes in contact with it have enough knowledge to fully utilise the tools of

business intelligence. A connection can be drawn to previous section about the usage of business intelligence as decision support. One of the reasons for the lack of actual usage could be an effect of insufficient knowledge. It clearly shows that actual IT-knowledge in Swedish organisations can be questioned, and when combined with business intelligence not being fully used as decision support should raise concerns. It can be argued that if IT-knowledge is improved amongst users it might result in a higher and more efficient usage of business intelligence.

5.3.4. User Friendliness

One of the factors for a success of having a BI-system that has been discussed in this research and by fellow researchers is end user satisfaction. End user satisfaction is connected with usage of a BI-system and low end user satisfaction can result in that potential users look elsewhere for information (King 1997) or that the users do not feel that the quality of the information is sufficient (DeLone & McLean 2003; Mudzana & Maharaj 2015). The majority of the users believe that the systems they come in contact with are easy to use. One can, from these results, draw the conclusion that end user satisfaction is regarded as high and that this cannot be viewed on as a reason for why business intelligence is not fully used as decision support. One of the reasons to why user friendliness is not considered as a problem can be an effect of the fact that the millennial generation is getting older and therefore constitutes a large part of many organisations. Millennials is described by PrincetonOne (2008) as people who are born between late 1970s and late 1990s and is considered as a “baby boomers” and therefore a large group of people. Millennials are according to PrincetonOne (2008) defined by the internet and the connected world and have probably been in contact with technological features such as computers, cell phones and video games from a rather young age. It can be discussed that these features make Millennial users more prone to technologies such as business intelligence systems and therefore find them to be user friendly. Based on the results of this study millennials are using BI as decision making support even though they might not have a senior position neither are working in the IT-department.

5.3.5. Knowledge in self-service business intelligence

Self-service BI is a trend which requires an increasing level of IT-knowledge amongst the users (Danielsson 2016), and most of the users outside the IT-department do not have the skills needed to use self-service BI in a proper way. In the hands of an unqualified user self-service BI can easily result in making bad decisions, based on for example analysing the wrong information (Svahn 2016). Overall the study confirmed that self-service BI is considered to be a useful tool, that there is problem concerning the IT-knowledge level amongst the most users and that the users are requesting more education in order to be able to use self-service BI. It can also be discussed that self-service is a popular trend amongst Swedish organisations. This combined with a questionable IT-knowledge amongst the Swedish BI-users in general leads to the argument that there are self-service BI-users with unqualified IT-knowledge on the Swedish BI-market. If so, this should be considered as a major problem which presents a serious threat to Swedish organisations as there is a risk of faulty decisions being made.

5.3.6. Summary

To summarise the discussion about the different topics above it can be said that there has been several arguments that tries to discuss the reasons behind the Swedish business intelligence users' attitudes towards business intelligence. On the first glance of the results one could easily assume that the problem areas with business intelligence does not exist amongst Swedish organisations but with some afterthought it can be argued that this might not be the whole truth. This is what has been discussed in this chapter, that there can be several reasons behind the type of answers that has been presented in this paper. Such as the amount of information humans are influenced by today affects the way we look and relate to information. That the distribution in age might be a reason to why the majority of the users do not feel that the business intelligence systems they come in contact with are hard to use. It has been discussed that users have a tendency to overestimate their knowledge and ability to make decisions and that this is one of the reasons why decisions are not based on the support of business intelligence. When looking at the answers it can be argued that surveys faces the risk of having answers which has been answered in a self-satisfying way, one could say that the answers makes the respondents look good. This phenomenon is called social desirability bias and occurs when respondents tend to answer questions in a more socially desirable way (Eysenck 2004). On an ending note it can be said that the users experiences does not align with the theoretical problems but that it has been argued and discussed that some of the problem do in fact exist even if they are not recognised or considered by the Swedish business intelligence users.

5.4. Discussion RQ2

The participants in this study that are using self-service BI also think it is important for them to produce their own BI-material. The self-service BI-users consider it to be benefit their daily work if they are able to produce their own BI-material and also consider this to be a part of their task assignments. The more qualified self-service BI-users, that consider themselves to have a high level of knowledge in database management, claims that the BI-material they are using are most often generated by themselves. The results also showed that these more mature self-service BI-users do not have a problem with the level of user friendliness of the BI-tools they are using and consider self-service BI to favour their daily work. This means that there is a relation between these statements that can support the theories about the importance of the level of IT-knowledge of the users of self-service BI (Danielsson 2016; Svahn 2016). The amount of respondents who do not use self-service BI was rather low compared to the ones who do. To what extent the self-service BI-tools are used amongst the respondents does affect how user friendly the respondents consider the tools to be, and that it to a higher extent favoured them in their daily work. It should be discussed that individuals who use something to a higher extent are more likely to develop a higher skill level and thus feel it to be more beneficial compared to those who use it more seldom, for example a few times a year. Someone who uses self-service BI more seldom may not be able to develop the same skills nor find the same features and might even run the risk of even forgetting some things in the system. It should also be noted that because of the low amount of respondents who are not using self-service BI there might be more correlations to be found than can be shown in this study. Just because the respondents do not believe the problems to exist does not mean that they in fact is non-existing amongst organisations. The respondents answers are to be considered as sources and should therefore be treated with the same source criticism as other sources (Esaiasson et al 2003). There could be argued that there is a tendency amongst people

to answer less truthfully when it comes to their own experience in order to paint a better picture of themselves. It can also be discussed that there might exist other problems besides the ones that were investigated in this study. The questionnaire only contained a small number of specific problems and left no room for the respondents to answer whether they experienced some other problems which was not mentioned.

6. Conclusion and reflections

6.1. Conclusion

RQ1: *“Do the decision makers in Swedish organisations experience main theoretical problems with business intelligence as decision support?”*

Based on this study, a conclusion can be made that the majority of the decision makers in Swedish organisations do not experience any of the main theoretical problems, when using business intelligence as decision support. The Swedish BI-users do not suffer from the quantity nor quality of information and do not find user friendliness to be a problem which differ from the previous theories. Swedish BI-users consider business intelligence to be an important support when making decisions. However, business intelligence is not fully utilised as decision support, since users to larger extent make decisions based on previous experience rather than with support generated by business intelligence. Furthermore, the users consider their general IT-knowledge to be on a high level. Thus it can be concluded that lack of IT-knowledge is not considered as a problem amongst the users. However, based on arguments of this study it can be concluded that a lack of IT-knowledge should be considered as a problem amongst many of the users who comes in contact with business intelligence. User friendliness is not considered as a problem amongst Swedish business intelligence users and one of the reasons for this that has been discussed is that many users are millennials who are used to technological features. Based on the conclusion about a lack of IT-knowledge amongst business intelligence users it can be concluded that there is also a lack of knowledge amongst those who use self-service BI. It should also be concluded that many of the users appreciates self-service BI and do feel that they want more education in the area.

Reasons:

RQ2: *“How is the use of self-service BI affecting the experience of these stated problems?”*

With the results from this study it can be concluded that the use of self-service BI does not affect the experience of the stated problems. However, the ones who use self-service BI to a greater extent also consider themselves to have a higher level of IT-knowledge, in particularly in data management. These more frequent self-service BI-users do not experience a problem with the user friendliness of the BI-tools which stands out from the rest of the participants in this study. This leads to the conclusion that the IT-knowledge affects the user experience and also affects to what extent the user will actually use the tools provided. This shows that this issue should be considered when introducing self-service BI in a company and to new users. Furthermore it can also be concluded that self-service BI can be considered as a popular trend in Swedish organisations. These findings can be used to argue that Swedish organisations are keeping up with one of the latest BI-trends.

6.2. Contribution

Overall this study shows that the problems on the Swedish market tend to differ to the global market. The study has contributed with a quantitative study on Swedish organisations about

certain problems with business intelligence. It also contributes with results which show that highlighted problem areas are not considered amongst Swedish employees who work with business intelligence. The study produces a picture of the participants beliefs and relationship towards business intelligence and their attitude regarding the trend self-service BI. This study also contributes with findings which show that Swedish organisations can be considered as mature in their way of keeping up with the latest trends in business intelligence.

6.3. Validity evaluation

6.3.1. Construct validity

We believe that we have collected empirical data that lies as a foundation as to which our problem statement and the research question of this study. We have through the entire method and result evaluation been cautious so that everything aligns with the theoretical framework to maintain a high level of construct validity as possible.

6.3.2. Result validity

We believe that we have good reliability as we have designed our survey based upon the findings explained in the theoretical framework and what has been stated in the method section. We believe the survey to be well structured and that the people who responded to it did not seem to have any trouble with understanding the statements. The statements were designed with closed questions which would lead to a lack of misunderstandings amongst the respondents. Good reliability together with good construct validity results in good result validity which we believe this study to have.

6.3.3. Generalisation

The result of this study is based upon a rather small number of participants which makes us not want to draw any general conclusions. More tendencies and correlations could be found with a greater number of participants and some kind of generalisation could be made. However, we feel that there is still substance to the findings that has been concluded and that these findings can still be applied to the field and could be interesting to anyone interested in the effects of business intelligence and users relationships towards it whether it be fellow researchers or organisations working with business intelligence.

6.4. Method evaluation

One of the reasons for the low number of participant may have to do with method of how the respondents were approached. In order to make sure that the right type of respondents were approached a telephone call was made to the respondent beforehand. The aim of the call was to make sure that the respondent was familiar to the subject and understood what the survey was about so that would be no misunderstandings during the completion of the survey. Another reason to why we wanted to make sure that the right people were approached was because we believed the quality of the answers would be of a higher standard and more valid

if we could make sure that the respondent had prior knowledge with the subject. We also believed that a telephone call would make potential respondents more prone to participate in the study and thus result in a higher response rate compared to just sending out emails. The majority of all respondents were contacted by phone and some by social media and email. The ones who were contacted directly via email were often colleagues who were referred to by other respondents which had been contacted via phone. Some of the respondents who were approached forwarded the survey themselves to other potential respondents, often within the same organisation. As a result of this, we received answers from respondents who had not been approached which resulted in an even higher response rate. However, it cannot be determined how many potential respondents the survey was actually sent to but approximately 85 people were contacted directly by us and we received 11 answers from respondents we had not been in contact with. This result leaves us with an estimation of a response rate of approximately 45-50 percent. A higher amounts of respondents might be reached with a different approach, such as mass mailing potential respondents or visiting some kind of company exhibition, but the quality and response rate of the responses can be questioned as it will be hard to control whether the respondents actually has knowledge about the topic. As mentioned above, it showed to be of rather importance of make sure that the respondents understood the topic of the survey and an initial phone call gave us the opportunity to do so.

6.5. Method reflection

The results in this study could have been affected by several different reasons which need to be discussed. To begin with the number of participants was quite few, only 46, compared to the more comprehensive international studies that states the problems investigated in this study. The number of participants might play a major part in the outcome of the results. Another issue that could have affected the outcome is the age of the participants. The age groups 18-29 and 30-39 are overrepresented since 37 respectively 30.4 percent of the answers were from these groups. This means that this study could have missed out on the extent of problems experienced by the older and more senior users. Although, the study shows that the younger generations do not experience the international stated problems, it would be preferable to have more users over 40 to validate the results for the Swedish BI-users in general. A major issue we encountered during the data collection process was that a majority of the people we contacted did not know the term “business intelligence”. During this process we learned how to explain what we meant in different ways in order to not scare people off. We found that many of the ones, who in the beginning claimed that they don’t use BI, were actually using BI-tools such as QlickView. In some cases people who we assessed to be perfect participants, still said they were insecure and asked us to contact a person in the IT-department instead. We estimate that this is one of the major problems with the method of this study since this probably affected the outcome. Even though we recognised this problem, and designed the survey in order to minimise the usage of specific terms such as self-service BI, we would have put even more effort to this matter if we were aware of the extent of the issue.

6.6. Further research

During this study it has been found that there could be a problem with the knowledge level amongst the self-service BI-users. In this study there is tendency amongst the participants to overestimate their own IT-knowledge level. It would be interesting to study this topic further in order to sort out what level of IT-knowledge the users really have, if they overestimate

their own knowledge, and if so find the reasons why. Preferably this could be researched through a more substantial observational study over time and/or an experimental study. Another suggestion for further research is to study what knowledge the user should have in order to get access to the self-service BI-tools and maybe even different types or stages of the self-service BI-tools. Preferably this could be studied by doing an experimental study to test the skills of many different users from different departments. Also this type of study could involve a comparison between the self-service BI-users from IT-departments and the users from other departments. To gain more depth in the studied problems and how they relate to the Swedish market one could do a qualitative study with in-depth interviews with participants from different departments. This way the problems and the underlying reasons to the problems could be presented more precisely and might also lead to new findings and solutions.

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Appendix

LIST OF APPENDIX FIGURES

Figure 12. Distribution of age.

Figure 13. Distribution of departments.

Figure 14. Distribution of positions.

LIST OF APPENDIX TABLES

Table 3. Question 29 (Occasionally I produce BI-material myself) & question 34. (I consider producing my own BI-material to be important.)

Table 4. Question 29 (Occasionally I produce BI-material myself) & question 33 (I consider it to favour my daily work if I am able to produce my own BI-material myself.)

Table 5. Question 29 (Occasionally I produce BI-material myself) & question 35 (I consider producing my own BI-material to be a part of my task assignment.)

Table 6. Question 30 (If “YES” on question 29: The BI-material I use is most often generated by myself.) & question 10 (I consider my knowledge in database management (such as SQL) to be:)

Table 7. Question 30 (If “YES” on question 29: The BI-material I use is most often generated by myself.) & question 32 (If “YES” on question 31: I consider the BI-tools that I encounter to be easy to use.)

Table 8. Question 30 (If “YES” on question 29: The BI-material I use is most often generated by myself.) & question 33 (I consider it to favour my daily work if I am able to produce BI-material myself.)

Interview guide

These are prepared questions used in the interview with Thomas Svahn. Other questions were used which were thought of as the interview went on.

General questions

- Position
- Education
- Previous experiences
- How long have you worked with BI?

About the Swedish market

- BI as decision support, which do you consider to be the largest trends on the Swedish market?
- Does self-service require less IT-knowledge than traditional in order to make it more user friendly or what is your opinion on this matter?

Branches

- Does the usage of BI as decision support vary from different branches and is it some branches where it is more popular?
- Are there any branches who are extra good at adopting and using BI and those who are not as good?
- Is the demand larger in some branches?

Business intelligence in general

- What do you believe is interesting to investigate in the area of business intelligence as decision support on the Swedish market?

Survey questions translated to English

These are the questions that was used in the survey and has been translated from Swedish into English.

1. Email address:
2. Age:
3. Gender:
4. Branch of industry:
5. The company's number of employees:
6. Position:
7. Department:
8. I consider my IT-knowledge to be:
9. I consider my knowledge in Excel to be:
10. I consider my knowledge in database management (such as SQL) to be:
11. Do you have any experience of using Business Intelligence: decision supports tools and reports, in your line of work?
12. If YES on question 11: How many years has Business Intelligence been part of your work?
13. I feel secure with my ability to make decisions.
14. I consider my decisions to be of high quality.
15. I consider myself to have enough knowledge to make right decisions.
16. I make decisions based on previous experiences.
17. I consider Business Intelligence to be important to the company in general.
18. I consider Business Intelligence to be an important part of my daily work.
19. I consider Business Intelligence to be important to the company's general decision making.
20. I consider the BI-reports to be reliable.
21. I consider the amount of information provided to me is enough.
22. I recognise that I am provided with too much information.
23. I experience it to be a problem for me to filter the information provided to me.

24. I base my decision on reports generated by a BI-system.
25. I consider BI to be an important support for me in order to feel secure with my decisions.
26. I consider BI to be an important support for me in order to make decision with high quality.
27. I consider BI to be an important support for me in order to make quick decisions.
28. I believe that there is a long waiting time in order to receive new ordered BI-reports.
29. Occasionally I produce BI-material myself.
30. If "YES" on question 29: The BI-material I use is most often generated by myself.
31. I have access to the company's BI-tools myself.
32. If "YES" on question 31: I consider the BI-tools that I encounter to be easy to use.
33. I consider it to favour my daily work if I am able to produce BI-material myself.
34. I consider producing my own BI-material to be important.
35. I consider producing my own BI-material to be a task of my assignment.
36. I consider myself to have enough knowledge to be able to generate all the support material I need.
37. I consider the company to provide me with enough education to be able to produce my own BI-material.
38. I want to gain more knowledge to be able to use BI-tools.

Results from Pearson's Chi-squared tests

Following tables are displays of the Pearson's Chi-squared tests which resulted in correlations between different questions.

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6,964 ^a	2	,031
Likelihood Ratio	6,318	2	,042
N of Valid Cases	46		

a. 3 cells (50,0%) have expected count less than 5. The minimum expected count is 1,57.

Table 3. Question 29 (Occasionally I produce BI-material myself) & question 34. (I consider producing my own BI-material to be important.)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	15,730 ^a	2	,000
Likelihood Ratio	17,107	2	,000
N of Valid Cases	46		

a. 2 cells (33,3%) have expected count less than 5. The minimum expected count is 2,09.

Table 4. Question 29 (Occasionally I produce BI-material myself) & question 33 (I consider it to favour my daily work if I am able to produce my own BI-material myself.)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	20,491 ^a	2	,000
Likelihood Ratio	21,256	2	,000
N of Valid Cases	46		

a. 2 cells (33,3%) have expected count less than 5. The minimum expected count is 2,35.

Table 5. Question 29 (Occasionally I produce BI-material myself) & question 35 (I consider producing my own BI-material to be a part of my task assignment.)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	10,022 ^a	4	,040
Likelihood Ratio	10,806	4	,029
Linear-by-Linear Association	3,558	1	,059
N of Valid Cases	38		

a. 5 cells (55,6%) have expected count less than 5. The minimum expected count is ,71.

Table 6. Question 30 (If “YES” on question 29: The BI-material I use is most often generated by myself.) & question 10 (I consider my knowledge in database management (such as SQL) to be:)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	10,113 ^a	4	,039
Likelihood Ratio	10,238	4	,037
Linear-by-Linear Association	4,077	1	,043
N of Valid Cases	33		

a. 7 cells (77,8%) have expected count less than 5. The minimum expected count is ,64.

Table 7. Question 30 (If “YES” on question 29: The BI-material I use is most often generated by myself.) & question 32 (If “YES” on question 31: I consider the BI-tools that I encounter to be easy to use.)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	12,900 ^a	4	,012
Likelihood Ratio	13,160	4	,011
Linear-by-Linear Association	4,968	1	,026
N of Valid Cases	38		

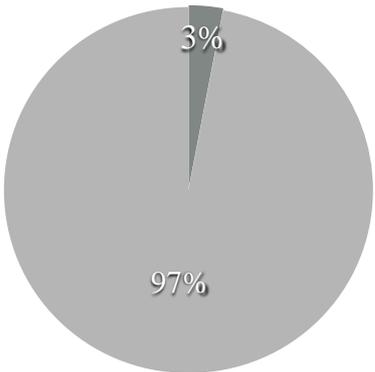
a. 6 cells (66,7%) have expected count less than 5. The minimum expected count is ,95.

Table 8. Question 30 (If “YES” on question 29: The BI-material I use is most often generated by myself.) & question 33 (I consider it to favour my daily work if I am able to produce BI-material myself.)

Results from analysing Millennials (age 18-39)

These figures shows the distribution of respondents who are Millennials and those who are not, if the Millennials are working in IT-departments or other departments and which positions which

- Millennials working in IT-departments
- Millennials working in other departments



were the most frequent.

- Millennials (18-39)
- Non Millennials (39+)

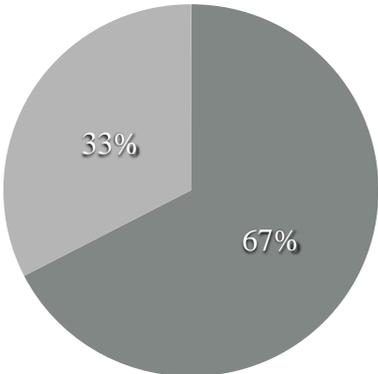


Figure 12. Distribution of age in percent.

Figure 13. Distribution of departments in percent.



Figure 14. Distribution of positions displayed as a word cloud.

University of Borås is a modern university in the city center. We give education programs and courses in business administration and informatics, library and information science, fashion and textiles, behavioral sciences and teacher education, engineering and health sciences.

At the **Department of Information Technology**, we have focused on the students' future needs. Therefore, we have created programs in which employability is a key word. Subject integration, wholeness and contextualization are other important concepts. The department has a closeness, both between students and teachers as well as between industry and education.

Our **courses and programs** with a major in informatics are centered around basic concepts as system development and business development. In our wide range of specializations there is everything from programming advanced systems, analyze the needs and requirements of businesses, to conduct integrated IT and business development, with the common purpose of promoting good use of IT in enterprises and organizations.

The department is carrying out IT-related **research** within the university's research area called Business and IT. In terms of field, the research activities are mainly within **computer and systems science**. Particular areas of focus are **data science** and **information systems science**. Both scientifically and professionally-oriented research are performed, which among other things is manifested through that research is often conducted based on domain specific needs of business and government organizations at local, national and international arena. The professionally-oriented research is also often manifested through our participation in the Swedish Institute for Innovative Retailing (SIIR), which is a research center at the University with the aim of contributing to commerce and society with the development of innovative and sustainable trade.



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