The Role of Users in Efficient Business Intelligence Solutions in Organisations

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Abstract

Med udgangspunkt i feltet om Business Intelligence (BI) og dets slutbrugere har dette speciale til formål at undersøge hvordan brugere er en del af processerne omkring udarbejdelsen af en BI-løsning. BI er anset for at være et værktøj, der har et enormt potentiale for organisationer, både i forhold til at understøtte men også optimere beslutningsprocesser, reducere usikkerhed og effektivisere forretningsstrategier og procedure. Omvendt er det også bevist, at mange BI projekter fejler, idet mange organisationer ikke opnår værdien af at bruge BI. Det er dog svært med udgangspunkt i litteratur at identificere, hvilken rolle slutbrugeren i organisationen udgør for at udnytte BI og dets potentiale og muligheder. I dette speciale er der først og fremmest udarbejdet et litterært overblik, som har til formål at undersøge, hvilken rolle slutbrugeren udgør i BI løsninger i forhold til de førnævnte processer i nuværende akademisk litteratur. Det er i specialet fundet, at det er svært at identificere slutbrugerens rolle i eksisterende litteratur om BI, og specialet har derfor taget udgangspunkt i at undersøge brugerne af BI for at kunne argumentere for, hvorfor det er vigtigt at inkludere disse i brugen af BI-løsninger i organisationer. Det gør vi ved at undersøge, hvilke aspekter, der giver slutbrugerværdi for at sikre effektivt brug af BI-løsninger. Specialet tager udgangspunkt i følgende problemstillinger;

1. *How is the field of BI users represented in current academic literature?*
2. *How can it be argued that the user is an important variable in creating more efficient BI solutions in organisations?*

Specialet gør brug af interpretivisme/konstruktivisme som indgangsvinkel til dataindsamling og forståelse. Dette gør det muligt at anvende metodisk triangulering i indsamling af data og opnå forståelse for brugernes oplevelse af at bruge BI til at løse daglige arbejdsopgaver og sammenligne dette fænomen med et teoretisk udgangspunkt. Specialet benytter interviews og spørgeskemaundersøgelse til at indsamle relevant data om BI-brugere. Som overordnet fremgangsmåde til analysen og fortolkningen af denne data vil studiet benytte både induktive og deduktive metoder. Specialet vil overordnet benytte den induktive metode, dog vil kodningsarbejdet af nøglekategorier i data blive forudbestemt på baggrund af en deduktiv metode med rod i eksisterende teori.

Ved brug af brugerorienteret teori fra Informationsarkitektur og Human-Computer Interaction viser det sig, at der er stor individuel værdi i at være en del af udarbejdelsen af BI-løsninger, som virksomheden vil kunne drage stor fordel af. Nøglekategorier fokuserer på

involveringen af slutbrugere ved Udvikling, Implementering, Uddannelse, Opfølgning og Tillid. Det bliver etableret, at brugere både har ønsker om at være en del af disse kategorier i udarbejdelsesfasen, men også at brugerne vil opnå en større samlet værdi og dermed et større udbytte af BI-løsningen ved at være en del af disse. Udover disse nøglekategorier er der i datafortolkningen fundet supplerende kategorier som kan have værdi for brugerinvolvering i udarbejdelsesfasen. Disse kategorier er Potentiale, Ulemper, Erfaring og Hyppighed. Specialet konkluderer, at der et behov for større fokus på brugere i BI løsninger for at kunne optimere brugernes værdi og brug af BI-løsningen, og få at kunne øge succesraten af BI-løsninger. Derudover er det argumenteret, at der er behov for mere relevant teori og litteratur med brugeren i fokus da dette kan skabe en mere strømlinet proces for brugerinvolvering i BI.

Projektet hjælper med at belyse brugerens rolle i brugen af BI-løsninger i organisationer og virksomheder. Studiet argumenterer, at for at virksomheder kan opnå et optimeret udbytte af BI løsninger og udnytte BI potentialet, skal løsningen have værdi for den enkelte aktive slutbruger i virksomheden. Disse argumenter er rettet både til brugere, virksomheder og distributører, da brugerinvolvering i brugen af BI-løsninger vil kunne skabe større værdi for dem alle. I specialet er det understreget, at dette endnu er et uudforsket område, og at der derfor er behov for flere studier til at belyse dette område.

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Chapter one: Introduction

1.1 Introduction

"With the implementation of BI systems, managerial discussions became more focused, largely due to a greater consensus on the reliability of the data" (Fink, Yogev & Even, 2017, p. 46). One of the many scholarly arguments that Business Intelligence (BI) is becoming an important and inevitable solution to manage information and handle large amounts of data within an organisation. It has been established that BI plays a vital role in enhancing the exploitation of data and transforming data into actionable knowledge and enhance decision making processes (Fink et al, 2017, p. 39; Ravasan & Savoji, 2014, p. 1935). However, as also discovered in several papers and publications, the literature to emphasize the factors which contribute to the beneficial use of BI solutions is lacking (Gaardboe & Svarre, 2018b; Fink et al, 2017, p. 38) and it seems unclear which circumstances that could ensure the most efficient use of BI solutions in organisations. Disregarding specific BI solutions or tools, BI is generally a software that in simple terms can extract, manage and analyse data and transform it into more tangible and visually manageable data, which is argued to facilitate decision making (Gaardboe & Svarre, 2018b, p. 1) and to improve it (Grubljesic & Jaklic, 2015, p. 299).

Academic literature about BI is an extensive area, however, literature on the end-user of BI solutions in organisations is a field to be further investigated. Based on literature reviews (section 1.3; Gaardboe & Svarre, 2018b) it is discovered that users of BI are rarely investigated. n Information System (IS) science use and the user are argued to be important factors in order to achieve success according to the DeLone and McLean IS success model (Petter & McLean, 2009, p. 160). Furthermore, scholars within Information Architecture (IA) Rosenfeld, Morville & Arango (2015) recognize the relevance of users in a particular Information Technology (IT) where information is shaped and describe users as complex, powerful, and unpredictable (p. 11-12; p. 333). Despite these scholars acknowledging the complexity and importance of users, how is it possible that users are not of the same importance regarding the efficiency and success of BI solutions?

BI has been an emerging technology since the late 1990's, but the potential of using BI systems and data analysis have first occurred to many organisations now. Ain, Vaia, DeLone & Waheed (2019) argue that research in success, utilization and adoption of BI solutions has

"grown substantially over the past two decades" (p. 1) while evidence suggest that many organisations fail to achieve the benefits, value and efficiency of BI (Ain et al, 2019, p. 1-2). In 2019 it is still possible for Ain et al. (2019) to conclude that "human factors have been largely ignored" in the studies of BI and that few studies take users' perspective into account (p. 7). Several publications emphasize the failure rate for organisations to meet the expected capabilities of BI (Bischoff, Aier, Winter & Haki, 2015, p. 6; Gaardboe & Svarre, 2018b, p. 2). According to Adamala and Cidrin (2011) it was estimated that ten (I.e. twenty) years ago in between 50-80% of all BI projects failed. Grubljesic and Jaklic (2015) argue the failure might be related to the expectation that BI solves business problems and that user acceptance of the BI solutions is instant and guaranteed (p. 306). It is indicated that knowledge about the BI system and potential and how to use the BI tool in depth is some of the challenges that users face (Grubljesic & Jaklic, 2015, p. 307) when having to use a BI tool as a support system for decision making and business optimisation. Grubljesic and Jaklic (2015) is one of the few user-centred studies within the field of BI whose study resulted in the argument that user's attitude toward change is one of the prominent organisational factors for the failure of BI systems. Grubljesic and Jaklic (2015) also emphasize factors such as implementation processes, user participation and training to be highly important to consider when expecting to meet the beneficial capabilities of BI. The article "Business Intelligence Acceptance: The Prominence of Organizational Factors" also identify that individual user characteristics such as age, computer literacy, training, prior experience, attitude, computer self-efficacy and anxiety are of critical importance when working effectively with BI in organisations (Grubljesic & Jaklic, 2015).

It is not only important to consider the user when implementing BI in organisations, as it has been investigated that the successful implementation of BI are dependent on various factors (Adamala & Cidrin, 2011, p. 108; Gaardboe & Svarre, 2018b, p. 2). The technical aspect of BI is huge and the amount of data to manage and analyse require technical skill and expertise. It is argued that technical resources are one of the various factors to ensure BI success, but that there is much more to successful and efficient BI use than technical tools (Adamala & Cidrin, 2011, p. 108). Another of these variable factors could be users and Adamala and Cidrin (2011) also found in their study that non-technical problems dominate BI projects, specifically those that fail and argue that among other variable factors that BI solutions must be "built with end users in mind, as they need to use it" (p. 125). Their quantitative study argues that the same Critical Success

Factor (CSF) framework of IS based on the Delone and McLean model does not necessarily apply to BI projects (Adamala & Cidrin, 2011, p. 126).

The elements that guarantees optimized use of BI in organisations to analyse data and enhance business practices are a combination of many variables. Several papers also argue that user involvement is a distinct factor in BI success. However, few actually study the user as an independent variable (Gaardboe & Svarre, 2018b, p. 8-9). It becomes relevant to investigate how the user experiences the efficiency and optimal use of BI in an organisation and which factors that users argue to be important in the successful use of BI solutions. The role of users in relation to value, efficiency and even success of BI solutions seems unclear. In order to address this observation in the literature it becomes relevant to investigate this issue from a user-centred perspective. Because the system of BI requires a user in order to be used it qualifies as a human-computer interaction (HCI). The field of HCI is concerned with the interaction that occurs between the user and the computer, which may seem obvious, however, the field of HCI is major. Computers can support users in decision-making processes and one of these decision-support systems is BI. According to Smith, Beatty, Hayes, Larson, Geddes, & Dorneich (2012) one of the current assumptions about the design of BI solutions is that user characteristics, context and environment are connected, and that users are not complex and unpredictable as previously mentioned (p. 590). However, Smith et al. (2012) argues that for users to be more effective and to efficiently carry out specific tasks in different contexts it is important that the designer knows and understand all of the characteristics of the user (Smith et al, 2012, p. 590). Smith et al (2012) suggest during the design processes of a decision-support system one must apply participatory design methods, needs assessments, and various analysis to identify critical features of the human perspective (p. 591). The need to collect these user requirements and include “human skills, needs and limitations” is to create highly usable and effective solutions that support decision making (Smith et al, 2012, p. 591).

It has by now been established that BI is a highly effective tool or solution to use in organisations to optimize business procedures and decision making by using, managing and analysing data. However, it has been discovered that literature has not yet determined which factors that directly ensures the value and efficient use of BI in organisations and which factors that leads to success with the tool. Many articles and papers emphasize the failure rate of BI projects and how the capabilities and expectations of the technology is not realised when implemented. There

are several reasons identified to have caused this failure, however, the role of the user in the success or failure of BI seems vague, despite the fundamental importance of users within IA and HCI as outlined by Rosenfeld et al (2015) and Smith et al (2012). This study therefore investigates the user of BI solutions in organisations by using qualitative and quantitative methods to analyse the users own experience of the value, potential, benefits, and disadvantages of the BI tool and learn about the users interaction with the tool and how BI can possibly optimise these users work tasks.

The study is conducted in collaboration with the accounting organisation Redmark as further described in the case description (chapter three). Redmark's main purpose is auditing, however Redmark has a digital department that specializes in developing BI solutions for customers in organisations. The development and distribution of BI solutions to customers has proven to be more problematic than anticipated and the knowledge of users of the BI solutions is limited, which has led the employees of the digital department in Redmark to wonder how users should be involved in the process of distributing, adopting and maintaining their BI solutions. The combination of knowledge about BI solutions from literature and theory and the practical issues identified at Redmark has led this master thesis to investigate the users perspective of the implementation, adoption, and/or use of BI solutions in organisations to experience and understand which elements are important for the users to effectively and beneficially use BI solutions in daily work tasks, because the role of users is seemingly important. Redmark functions as the practical example of what is discovered in literature and theory. It is implied that if the BI solution must achieve success in an organisation, the employees that actually uses BI to improve business procedures are also a great part of ensuring the overall success of the BI adoption and use. The study seeks to understand if and how users see a potential in BI, how BI benefits the organisation and whether the use of BI is at its full potential in the organisations or if any disadvantage exist about the BI tool.

By establishing existing fundamentals about the literature on BI, theory on the DeLone and McLean IS success model, how to understand the CSF for BI and how HCI and IA might play an important role in the implementation, adoption and use of BI solutions it has been established to investigate the somewhat unknown user aspect of BI solutions in organisations. The following research questions will be investigated;

1. *How is the field of BI users represented in current academic literature?*

2. *How can it be argued that the user is an important variable in creating more efficient BI solutions in organisations?*

Following the overall research methodology of interpretivist/constructivist paradigm (chapter three) the experience of the users will be investigated by distributing a questionnaire and executing interviews. The purpose of investigating the user aspect and their experience of working with BI solutions in organisations is to suggest the important role users should constitute when discussing success and failure in the use of BI solutions for the accomplishment of work tasks in an organisation. By using the informative words of interview respondents, it is possible to understand the user and thereby the role of the user in relation to BI solutions and how certain elements are important regarding the use and/or adoption of BI solutions according to users.

1.2 Table of contents

The following paragraph is a guide to the reader and is supposed to help create an overview when reading the thesis – it is a short description of the structure and framework for the layout of this project. It will also shortly outline the theme of each chapter. In this project the use of 'we' or 'our' will refer to the two students in this master thesis however, the use of these personal references will be limited. The order of the appendices will also be presented.

Chapter one explains the introductory approach to this study and outline the result of the literature review and how the review contributed to shape this study.

Chapter two reveal the entire theoretical foundation and goes through the concepts of IA and HCI and includes relevant themes for this thesis identified from literature. The relevant themes and theory of IA and HCI is applied in the analysis and discussion chapter.

Chapter three discloses the methodological contributions and how these complement and relate to one another. This chapter outlines the strategy for collection of data. Among this chapter, the method for the literature review, this study in relation to the case of Redmark and the research methodology are also outlined.

Chapter four summarises the three first chapters and how they interplay.

Chapter five present the empirical data, the analysis strategy and the core and additional categories.

Chapter six executes the analysis. The analysis applies core- and additional categories to identify patterns and relevant findings in the collected data

Chapter seven discusses the findings from the analysis in relation to theory, methods and practice.

Chapter eight present the limitations and sources of error for this thesis and suggestions for future research.

Chapter nine reveal the conclusion and present the important findings of this study and answers the research questions based on the analysis, discussions and collected data.

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1.3 Motivation and Literature review

The motivation for studying users within the field of BI naturally occurred during the internship and work at Redmark. During the work with BI, we were forced to deal with how we could design a process that would ensure more beneficial adoption of BI for the organisations and we were encouraged to think about this process in both practical and academic ways. As information architects our thoughts and motivation immediately come from studying users and the idea of conducting an entire process of developing, implementing and using with the end-user in mind.

When the problem area was identified, it was necessary to get a grasp of the academic literature about users of BI. The topic was therefore inspired by the work of Gaardboe & Svarre (2018b) who identified gaps in the literary field of BI and the factors that are critical for the success of BI. By conducting a thorough literature review they manage to outline the areas which are limited in the area of BI. It is discovered and argued that investigations of end-users of BI are limited. It was encouraging to experience the issue of BI and users in practice, but it was further motivating to discover that the issue also existed in literature. This study is motivated mainly by the literary gaps in BI and users and takes its point of departure in this academic gap and therefore motivated to further investigate this issue and address it in this master thesis.

1.3.1 Literature review

To further investigate this area, it was important to narrow the subject. In order to do so, another literature review is executed specifically to fit this study and to ensure that the right questions are addressed. The entire methodology for this literature review is demonstrated and outlined in chapter three (section 3.2) and in appendix one.

A literature review is in other words a way to execute a search. The search is conducted in order to expose a certain area of an academic field. Therefore, it is important to decide which area and topic you will investigate beforehand, however, not specified and down to the last detail of the study. It is simply necessary to have some preliminary thoughts of what to investigate and then let the literature review determine in which direction the study should be directed. In order to carry out a profound literature review a structured and systematic approach is necessary – in other words, a method. The method for the literature review will as mentioned be described and outlined in the methodology chapter.

The literature review comprises an important role for this study. The review reveals interesting knowledge about the literary field of BI and the focus of the current studies of BI. The point of conducting a literature review is to achieve a sort of guideline that will assist in the decision process of where to place the focus of the study to ensure that the study is new to the academic literary field or that it complements the existing area. The literature review to some extent exclude the possibility that you would execute a study that had already been done. Furthermore, the review is a great support system to discover relevant scholars within the relevant field and to both question and investigate the topics that has already been conducted. he review and the systematic approach were also inspired by the review conducted by Gaardboe and Svarre (2018b). As can be seen in the methodology for the literature review, the literature review conducted in this study resulted in seven relevant articles. It is interesting to investigate some of the similarities and differences of these seven publications. The seven results are presented below:

Gaardboe, R, & Svarre, T. (2018a). BI End-User Segments in the public Health Sector.	Journal Literature review Qualitative study Suggest use of qualitative studies with users
Adamala, S., & Cidrin, L. (2011). Key Success Factors in Business Intelligence.	Journal/ article Quantitative study Literature review Suggest that BI is build with end-users in mind
Jooste, C., Biljon, V. J., & Mentz, J. (2013). Usability Evaluation Guidelines For Business Intelligence Applications.	Conference paper Quantitative survey and questionnaire study User observation Framework for usability, compared to existing literature by including users
Gaardboe, R., Sandalgaard, N., & Sudzina, F. (2017b). The importance of task compatibility for web-enabled Business Intelligence success in e-government.	Conference paper iiWAS Literature review Quantitative Survey-based questionnaires Positive results in the relation between task compatibility, use and user satisfaction in BI
Tamm, T., Seddon, P., & Shanks, G. (2013). Pathways to Value From Business Analytics.	Research paper Qualitative Semi structured interviews Literature review BI is only valuable if used, identification of analytic end-users.
Hou, C. (2012). Examining the effect of user satisfaction on system usage and individual performance with business intelligence systems: An empirical study of Taiwan's electronics industry.	Journal paper Literature review Quantitative Survey based Uses Likert scale for questionnaire Limited research on end user satisfaction

Molensky, L., Ketter, W., Bloemhof, J., & van de Koppel, H. (2010). Business Intelligence gap analysis: A user, supplier and academic perspective.	Conference paper ICEC Literature review Quantitative Survey based Users are a major stakeholder in the field of BI, investigates experience and expectations of BI users and the gaps between users, suppliers and academics.

These seven articles all focus BI and its users. All seven articles conduct a literature review to cover the area of which they investigate in, and all have identified that the user-centred study is lacking in the field of BI. Five articles are all published in between 2010-2013 and one from 2017 and one from 2018. The relatively low amount of article findings in this literature review both disclose something about the literary field about BI and users, but also on the scope of our literature review which was only two databases and specific search terms (appendix 1). This literature review can therefore not be said to cover the entire academic field on users of BI, however, that is why this study is also based on the findings and literature reviews of other studies.

Only two of the studies identified in this literature review applies qualitative interviews as a method. This discovery made it clear that the specific experience from users are rarely investigated and that users' individual words are not interpreted. This part of investigating users is not common in literature and it is directing this study to apply the method of qualitative interviews to complement this part of user studies within BI. Gaardboe and Svarre (2018a) also suggest in their study to apply qualitative studies with users to achieve meaningful results. On the other hand, most of the articles apply quantitative method and more specifically, a survey-based approach. A survey is therefore an acknowledged approach when studying BI and users and it is therefore also applied in this study to support the thesis and supplement interviews. The methods for these seven articles functions as important inspiration and validation for this study and the methods and theories are studied to identify the focus areas of this master thesis. These seven articles constitute an active role in the theory and methodology section of this study.

The review also demonstrates something about the themes which are present in the literature between the years of 2010 – 2020 concerning BI and end-users. For these seven articles different themes occur. The article by Gaardboe and Svarre (2018a) is dedicated to the public Health sector in Denmark. Adamala and Cidrin (2011) investigate successful BI projects of vendors in Poland. Furthermore, the usability testing and evaluation of BI solutions conducted by Jooste et al. (2013) is investigated within the coal mining industry in South Africa. Gaardboe et al.

(2017b) conducted a BI success investigation within public e-government in Denmark by focusing on the role of task compatibility in relation to BI users. Tamm et al. (2013) identifies pathways to value of BI in organisations by defining different types of BI use which leads to the identification of two critical user types. It supports their claim that knowing users use of BI tools is an important pathway to BI value in organisations and the knowledge was achieved by conducting interviews with different user types in advisory and sales companies in Australia. Another case study by Hou (2012) to understand user satisfaction is in system usage of BI is conducted within the electronics industry in Taiwan. Lastly, Molensky et al. (2010) identifies gaps between supplier, user and academics in order to identify existing issues in the success of BI implementation. The study takes its point of departure in literature reviews and a survey that is shared on social media. The study therefore includes users from different companies in many different countries such as the Netherlands, India, Australia, US, Germany, Russia, UK, France, Brazil and Denmark.

The studies of users of BI solutions are therefore spread across the world within different industries and different organisations and companies. There are not immediately identified any specific requirement for the choice of organisation and for how long these organisations might have used BI solutions or if the BI tool is controlled and developed in-house or by an external company. The studies of users exist in different industries and users still need to be identified and the role of these in the efficient use of BI solutions in organisations. There are still many industries to study. However, the industry of the finance is not identified in this literature review. This study therefore illuminates the investigation of users from even another perspective and theme which is users in different types of organisations in Denmark within the context of the financial industry or sector (see chapter three). Besides experiencing which literature that existed about BI and users at this point, it was a motivation to conduct the literature review to discover which themes, methods and approaches that was useful to investigate and apply when discovering the experience of users of BI. The literature review is therefore a large part of structuring this project and how to relate and structure the different elements of this thesis in order to answer the research questions.

Chapter two: Theory

This chapter outlines the theory that this thesis is based on. By combining literary identifications from the literature review and scholars within the field of IS and IA it is possible to explain the theoretical foundation for the collection of data and the execution of the analysis and discussion. The chapter begins with outlining the aspects of IA and HCI and how these two relate to the subject of BI. Furthermore, the chapter describes and discusses the IS success evaluation framework of DeLone and McLean and how it is relevant in relation to this study. The chapter will then go through the themes of BI and how to understand the terms success and value. Lastly, the individual concepts relevant to examine in this study will be and outlined. The theory chapter determines which concepts that will be the focus of the interviews and questionnaire and why these concepts apply.

2.1 BI

In this study, the term BI is defined as a BI system that is "designed to transform organizational data into intelligence through a process that combines data integration with data analysis" (Fink et al, 2017, p. 40). BI is then adopted to "facilitate decision support, environmental adaptation, and organizational innovation" (Fink et al, 2017, p. 38) in an organisation. This study will regularly apply the terms BI solution, BI tool or BI technology and these terms refer to the same definition of the software which is used to display and/or visualise the analytical results produced by using BI. In other words, BI solution, BI tool or BI technology refer to the software that provide the BI functionality and use to a user. The visualisation in which the BI results are presented is called the interface which is also explained later in this chapter.

2.2 Information Architecture

Is it has been argued so far that this master thesis takes its point of departure in a user-centred approach to BI and how the user values BI solutions in organisations to assist in decision making or other work tasks. In order to investigate this, it is imperative to set forth a theoretical fundament for the investigation of users and to argue which elements and concepts are relevant to analyse. This section is important to explain the topics which will be the focus of the interviews and questionnaire and why these topics are necessary to be aware of when working with users of an

IS, technology, interface or solution. To explain why these topics are necessary, important scholars and academic works within IA are applied.

As will be discussed later in this theory chapter, the relation between an IS and BI can differ and the frameworks for measuring success and value can not necessarily be applied to BI in the entirely same way as applied to IS according to scholars (Adamala & Cidrin, 2011, p. 126). Moreover, BI and IS cannot be classified in the same way, but BI still has the possibility to act as a vital part of an IS, in the form of converting raw data to information and making it accessible to analysis and interpretation. BI solutions are therefore also relevant to investigate from the perspective of IA, because it deals with the entire structure of creating meaningful information that is adapted to its specific users.

Within IA the three concepts of users, context and content are inevitable and are applied to illustrate the complex structures that exist within information environments. The concepts imply the resources that must be considered regarding project goals, design and implementation (Rosenfeld et al, 2015, pp. 32-33). These concepts exits in order to ensure a good IA, however, the concepts of IA also relates to BI systems as BI is an information technology or tool which should be designed bearing in mind that those who must use the information transformed by BI can understand what the information is for and how it can be used.

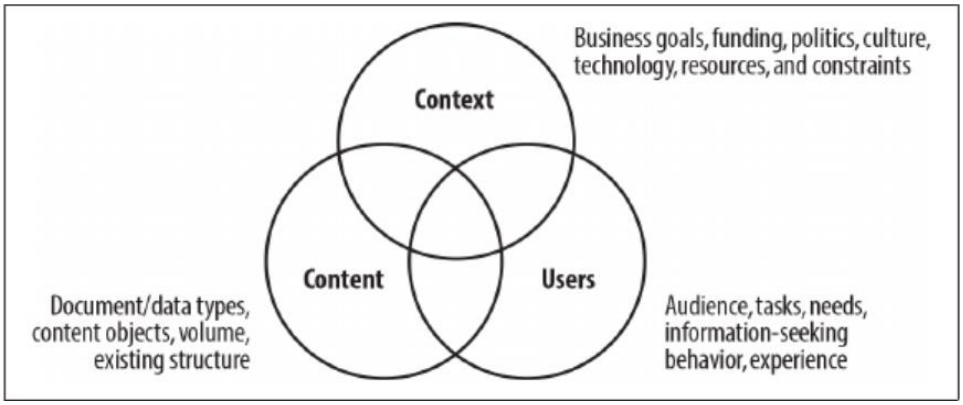


Figure 1: The three circles of information architecture (Rosenfeld et al., 2015, p. 32).

The context concept describes how the project at hand exists within a certain context, for example an organisational or business context (Rosenfeld et al, 2015, p. 34-35). Just like a website, the structure and vocabulary must reflect that of the specific organisation, employees or customers i.e. the users. According to Rosenfeld et al. (2015) one of the keys to success is to understand the

context of the project (p. 35). Content says something about the amount and volume of data and what constitute the information that is needed. In relation to BI the content is the huge amount of data that is transformed and managed into useful information. And the content and data can only be known and make sense if you ask users. The users are the ones that "will use your information environment" (Rosenfeld et al, 2015, p. 37). The differences and similarities in users and the unpredictable component that users compose in any IS where users are present can also differ in any context. Information Needs change and it is necessary to ask "Do you know who's using your system? Do you know how they're using it? And perhaps most importantly, do you know what information they want from your systems?" (Rosenfeld et al, 2015, pp. 37-38). In order to answer these questions, it is necessary to investigate and ask the users, which is one of the main purposes; whether the users can be argued as an important variable in the efficient, valuable and successful implementation and continuous use of BI solutions in organisations.

In 2012 BI technology was also identified as a decision-support system (DSS) (Smith et al, 2012, p. 590). In the chapter 'Human-Centered Design of Decision-Support Systems' Smith et al (2012) focus on the issues that might occur in the interaction between users and these computer systems that can "assist with tasks such as planning, diagnosis and process control" (p. 590), as well as approaches to understand users and the role of users in the integration of a DSS or BI solution. This chapter will outline aspects which will be argued to be important when working with a technology that is used by end-users. However, it is relevant firstly to explain the field of which this study also evolves in which is HCI.

2.3 Human-computer interaction

HCI is a disciplinary field that touch on multiple disciplinary areas and is concerned with the "theory, design, implementation, and evaluation of the ways humans use and interact with computing devices" (Kim, 2015, p. 1). The interaction describes the abstract sphere where humans interact with the computer technology and interface describes the technical display in which humans interact with it. In this study, HCI is the user interacting with the interface of a BI solution, which is also one of the most important and useful tools of BI; the dashboard (Negash & Gray, 2008, p. 175). According to Kim (2015), the main purpose of HCI is to ensure high usability and efficient interaction which will lead to easy to use technology, efficient tasks, safety and correct completion of tasks which will result in high productivity (pp.1-2). HCI is moreover, focused on

how information can be manipulated to the advantage of humans. BI is a technology which is encompassed by the notion of HCI because end-users must interact with the interface (dashboard) of BI and the BI technology manipulate information or data into the advantage of humans and to advance business procedures in organisations. HCI must be considered in order to create efficient BI solutions for the end-users who interact with the system and actively use it.

As explained earlier, the successful adoption of BI solutions in organisations is also argued to include many different criteria. HCI implies that in order to have good HCI design it is necessary to among other things consider the users (Kim, 2015, p. 3). It is one of the key principles of HCI to "know thy user" (Kim, 2015, pp. 3-4) and build the computing device or technology around the target users. Kim (2015) emphasize that it is common for designers or developers to anticipate the user by "guessing and pretending to know and be able to predict how the representative user might respond to one's design" (p. 4). In this quote Kim (2015) emphasize on issues which are also identified about BI. Users are rarely identified and investigated and the process of implementing, designing, developing and adopting BI solutions are not user-centred or focused on target users. Another important aspect of good HCI is to understand the task that users must accomplish with the interaction of the system. In order to know which tasks that the user must be able to accomplish by using the system, or in this case a BI solution, it requires that the designer or developer must know the user (Kim, 2015, p. 6).

According to Preece, Rogers and Sharp (2015) HCI is all about developing technologies "that are easy, effective, and pleasurable to use – from the users' perspective" (p. 29). It is therefore considered in this study that including principles of HCI in the development of BI solutions and dashboards the BI solution become more efficient and beneficial. Within the disciplinary field of HCI it is a key principle to include the user in the entire design process for the user to accept and use the technology to support decision making and to have good interaction with BI dashboards. It is therefore theoretically argued that including users within HCI and the success of IS it is possible to achieve good and successful systems for the user, which benefits productivity and efficiency (Kim, 2015; DeLone & McLean, 2003). In this study, it is discovered that users are not a main focus when investigating the success or failure of BI solutions in organisations. The focus of this study was therefore decided to be user-centred and investigate how users of BI solutions in different organisations actually value the BI tool and which elements contribute to efficient and advantage use of BI. To investigate users, certain topics are included in

the interviews and the questionnaire executed in this study. The topics and why these topics are chosen according to theory is argued in the following sections.

2.4 Interplay between IA & HCI

IA determines and optimise the information that will be visualised in an information environment or an interface of a BI solution. The information is chosen, named and categorised on behalf of studying the user. Without IA the information that the BI technology transforms into useful information that can facilitate and even optimise decision making and business procedures might not be as beneficial because the information is not what the user needs. HCI illustrates the interaction between the user and the interface of the technology that is interacted with. It is important to understand and study how the user uses the technology for it to be its most valuable. Theory of HCI suggest that for a technology to be valuable it must be used, and it will only be used if users are satisfied when using it. IA and HCI are therefore interrelated as both theories constitute the most beneficial outcome of a technology and therefore also BI. The use and outcome of BI tools in organisations could according to IA and HCI be at its most useful and valuable level if the user is considered and understood when it regards the information, the interface, design, usability and use.

2.5 DeLone & McLean: The IS Success Model

The DeLone & McLean (D&M) IS Success Model is a well-known and high regarded guidance model for measuring and analysing criteria of success in ISs. Based on previous work within the sphere of IS and the success hereof led to the development of a comprehensive and multidimensional model of IS success. The literature, theoretical and practical foundation for the D&M IS Success Model led to the inclusion of multiple areas deemed important by DeLone and McLean in 1992 (DeLone & McLean, 2003, pp. 10-11). These areas can be seen below in figure 2.

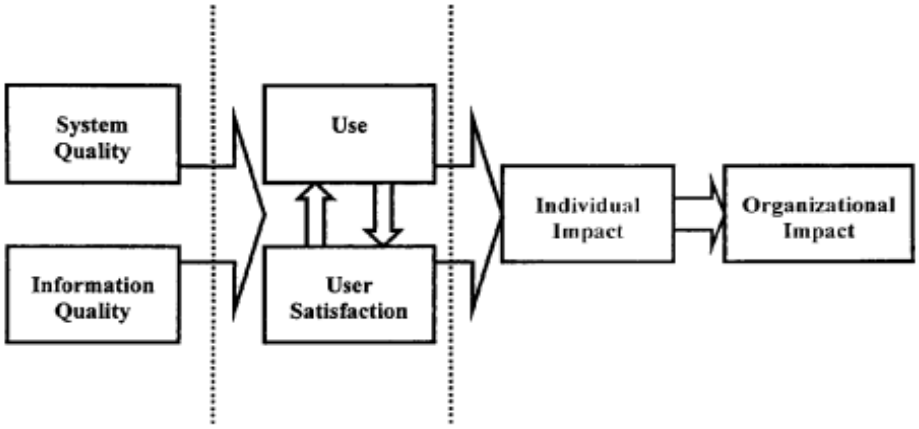


Figure 2: DeLone and Mclean original IS Success Model.

As demonstrated in figure 2, the different areas of the model include System Quality, Information Quality, Use, User Satisfaction, Individual Impact, and Organisational Impact. These different pillars all measure different dimensions that contribute to the success of an IS. System Quality measures technical success criteria, measuring whether the system has the right characteristic for producing good information. Information Quality measure the semantic success of an IS. Use, User Satisfaction, Individual Impact and Organisational Impact measure success in form of effectiveness and investigates whether an increase in effectiveness can be concluded (DeLone & McLean, 2003, pp. 10-11).

As previously mentioned, these are the aspects of user success in information studies as found relevant through past studies and research (DeLone & McLean, 2003, pp. 15-16). These are also aspects that are generally accepted to be of great importance in user satisfaction effectiveness studies. However, due to suggestion from other researchers DeLone and McLean updated the model and made several modifications to the model in order to better accommodate change that naturally occurs in ISs (DeLone & McLean, 2003, pp. 15-16).

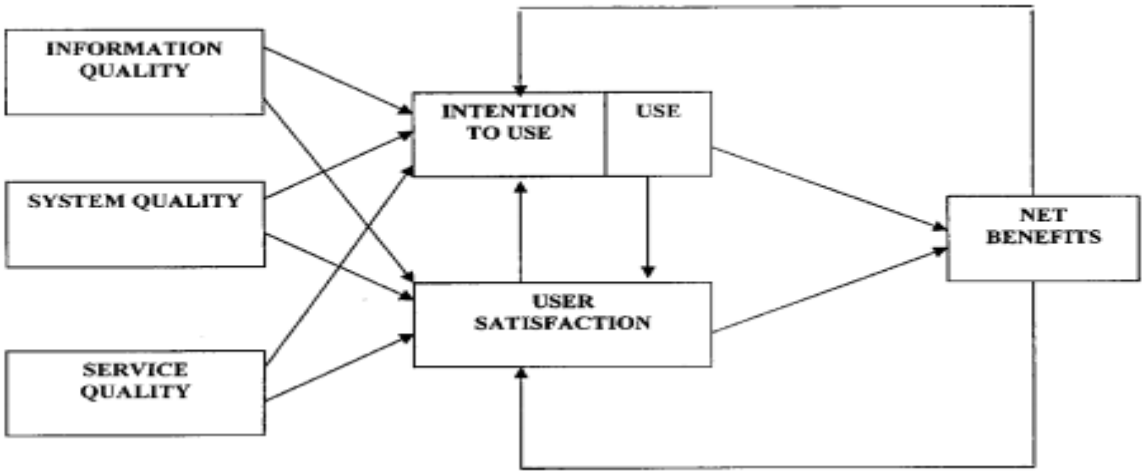


Figure 3: Updated D&M IS Success Model

One main difference to notice is the "new" distinction made between Use and Intention To Use. This is to be understood in the way that Use is a measure of behaviour and Intention To Use is a measure of attitude (DeLone & McLean, 2003, p. 23-24). DeLone and McLean (2003) argues that it is difficult to measure the direct link between Use and Intention To Use or in other words the link between behaviour and attitude, and subsequently sees these as far links however, only ever interrelated due to other aspects of the model. The final analysis produces Net Benefits. Net Benefits are the end findings in the deployment or evaluation of the success of an IS where the system is found to have either positive benefit or negative with regards to the user's involvement (DeLone &McLean 2003, pp. 23-24). A point to be made about the original model and the updated model is the focus, as shown by arrows, on interrelations between the different aspects of the model. DeLone and McLean (2003) argues that the focus on the interrelation of actions are what validates the model and its ability to measure different instances (p. 24). According to the study conducted by Ain et al. (2019) the D&M IS success model is one of the three most commonly used and cited models when researching and investigating BI systems (p. 6).

2.5.1 Critique of DeLone and McLean's IS Success Model: Distinguishing BI and IS

To classify BI solutions as an IS would be erroneous. An IS is a software or system that provides information from data via organisation, systemisation, analysis and visualisation (Olsen & Bryant, 2011, pp. 1-2). BI is a term used for software that visualise information or raw data in order to present it as interpretable within several work areas (Olsen & Bryant, 2011, pp. 2-3). BI does not

uphold all of the capabilities of an IS, BI does however, possess the ability to act as a vital part of an IS, in the form of converting raw data to information and making it accessible to analysis and interpretation. Furthermore, ISs have the capability to store and connect data locally, BI software is constrained to external data storage and connections. BI instead acts as a Decision Support System (DSS) and a surveillance tool (Negash & Gray, 2008, pp. 175-177). BI solutions provide a dynamic visualisation of data and information that can be used to monitor key numbers for a business in order to make decisions based on these data. Negash and Gray (2008) furthermore argue, that the term BI not only separates itself from an IS but has to some extend exceeded and substituted the term (p. 176).

Although much research of BI solutions and the success of these have been done with the inclusion of the DeLone and McLean model of IS Success (Ain et al, 2019, p. 6; Gaardboe, Nyvang, & Sandalgaard, 2017a; Mudzana & Maharaj, 2015; Gluchowski, Dinter, & Schieder, 2011) some scholars find it insufficient in some areas. Within these studies the research finds the DeLone and McLean model to be lacking in certain areas, specifically within areas of user research. This study will focus only on the user because it intends to investigate why user participation in BI development and implementation is of vital importance. The IS Success Model does not encapsulate this to the extent found necessary for the study. The argument that the IS Success model cannot be applied to BI user centred research is made by Adamala and Cidrin (2011). Adamala and Cidrin (2011) argues that any software solution designed for users should be developed and implemented with the user in mind at all time (p. 125). This argument encapsulates the objective of the study, to prevail the idea of the importance of user centred design, development and implementation. Furthermore, it is argued by Gaardboe et al. (2017a, p. 489), that one of the issues with interrelation within the model is the idea of Use and User Satisfaction, and that these are not substantial enough within the model. The IS Success model can, within the realms of this study, be critiqued for being too focused on technical factors and not focus on human factors, such as information need and experience regarding the success of an IS. As mentioned, this study investigates the importance of user involvement of BI solutions in organisations, therefore the key aspects used to investigate and measure this must be within the realm of human factors. Smith et al. (2012) argues, that in order to create and perform a proper user centred study, design, development or implementation phase there is a profound need to collect and measure these human factors (p. 590).

Based on literature on BI and the IS Success Model the conclusion is to not present the model as being a key framework for measuring the aspect of value, experience, satisfaction or success of users of BI, as the use of the IS Success Model is considered insufficient regarding user involvement.

2.6 Success, Value and Critical Success Factors

These three terms might seem vague and might have different meanings according to who is asked. Therefore, the terms require further explanation and definition in accordance with the use of these terms in this thesis. Success is the fulfilment of a task to satisfaction (Inge, 1929, p. 281). Success can be measured in many ways within many contexts with different variables to what makes a specific task a success. Within the context of Information Technology (IT) success is often linked to the idea of a well completed development or implementation process of a software or system, that in turn lead to better or more efficient results in information sharing, scraping, strategy etc. (Rosenfeld et al, 2015, pp. 11-12). According to Rosenfield et al. (2015) success could also, in terms of IT, be measured in how much value a system, website or software brings to others, in that context others being the user (pp. 11-12). Success is the initializer and catalyst for value, it must therefore be present to create value.

If success is the catalyst for value what is value then? According to Kaiser and Young (2013), value is having things the way we want (pp. 20-21). They describe value from a user-centred perspective with the notion that value is the idea of having an expectation about reality and having that expectation met by whatever means possible. This goes for all context be it business, IT, everyday. Value is the notion that the task faced in any situation are easy to navigate due to the meeting of one's expectations of the solution to set task. Within IT systems, this can be transferred to the notion that we expect specific buttons or processes to work a specific way, this will increase usability and the user experience and in turn create value to a system (Rosenfeld et al, 2015, pp. 326-328).

As previously mentioned, one must have success and an understanding of what success is within the given context in order to create value for the end user. This can be ensured by analysing and identifying CSF. CSF are a number of areas that for a business or user ensure competitive performance and value, to the extent that the CSF are fulfilled. These are areas that define the critical areas that must succeed within the context in order to create overall success for

the task at hand and thereby create value (Leidecker & Bruno, 1984, pp. 23-24). This study takes a user-centred perspective to BI solutions and seeks to investigate value from the experience and perspective of the BI user. Therefore, the areas of success that must adhere are strictly permitted to the user. Gaardboe and Svarre (2018b) found that there are several areas worth considering within the succession of BI solutions and end users. Within the literature review Gaardboe and Svarre (2018b) concluded that some of these areas include User Experience, Expectation and Trust (p. 6). These are all concepts that will be considered in this study as well. The study seeks to gain understanding of the users perception of these concepts in the context and use of BI solutions in daily work tasks. The user-centred perspective within theory and method will be elaborated on in the following sections and chapters. The reasoning for this user-centred perspective is the believe that value is a construct of humans e.g. users. Kaiser and Young (2013) explains that value equals happiness. This points directly to the user and the experience the user perceives when using a system such as a BI solution (Kaiser & Young, 2013, p. 2).

2.7 Theoretical Foundation for Questionnaire and Interviews

The following sections outline the dimensions found important in user research and understanding. These are dimensions that through literature review and other relevant sources of literature have been concluded to be of vital importance when studying users of IT systems or software, including studies involving BI solutions.

2.7.1 Development and implementation

During the development and the implementation of a BI solution it is important to include users. Development within IT is typically reserved for the technical aspect of building something within a specific technology. This study does not aim to investigate whether users should have the ability to do technical development on or of a BI solution. Development and user involvement in this is to be understood as the investigation of user involvement in the development process i.e. that users should be involved in the form of prototype testing, information use, usability testing and testing in general, alongside a developer in order to create a better, more efficient and relevant product. This is furtermore, not to eliminate the importance of testing later on in the process however, as a way of making users a part of the end result of the product and the future wishes for the BI solution. Users are “the ultimate judges” (Rosenfeld et al., 2015, p. 333) of the information solution and it is beneficial for the product if the users work as your allies (Rosenfeld et al, 2015, p. 334). One

way of getting users to become an allied is to include users in the development and implementation process and let users contribute with input or wishes to the development and implementation but also to know user's information needs thoroughly. Grubljesic & Jaklic (2015) argues that user's attitude toward change is one of the prominent organisational factors for the failure of BI systems. To include users in the development and implementation processes could ease the attitude toward change because the user gets involved in the process and the change might not seem as invasive. Rosenfeld et al (2015) argue that interaction with users during the entire strategy is critical and creates better information solutions (p. 350). It is furthermore, discovered that non-technological problems are a major factor in the failure of BI projects and that one of the solutions to these problems might be to build BI solutions "with end users in mind, as they need to use it" (Adamala & Cidrin, 2011, p. 125). At Redmark, it is also a question to which extent users should be included in this process and what benefits it could have. Grubljesic and Jaklic (2015) also identify the participation and involvement of users in the implementation as a determinant of user acceptance of BI (p. 304).

2.7.2 Training

Negash and Gray (2008) argue that because BI is used by many companies and the number of employees in organisations using BI for decision making, forecasting and other work tasks is heavily increasing, improved training is important as more people become involved (p. 192). To ensure efficient and valuable BI solutions in organisations it is relevant to train and educate relevant employees. Multiple factors are present in the attitude toward using the BI solution such as age, computer literacy, training, prior experience, attitude, computer self-efficacy and anxiety (Grubljesic & Jaklic, 2015, pp. 303-304). These factors are of critical importance when working effectively with BI in organisations and to anticipate these multiple various factors training can motivate more people to understand an use the BI tool without being a technical expert that necessarily knows the technology that enables BI and how it functions. As mentioned, more and more people in organisations apply BI solutions to solve work tasks and all employees might not immediately experience the benefits and potential of BI and may be reluctant to use it. As identified by Tamm, Seddon and Shanks (2013) some BI users might not be technically or analytically skilled which will require training for these users to use the BI solution efficiently (p. 3). Training is highly important to consider when expecting to meet the beneficial capabilities of BI and Grubljesic and

Jaklic (2015) also identify user training as one of the determinants for user acceptance of BI (p. 304).

2.7.3 Feedback

The evaluation part of a BI solution is important to ensure that user needs are accommodated and that the technology functions optimal. To ensure the value and effective use of a BI solution it is important to continuously ensure that the organisation and users have the information that they need. Organisations, information and users change and therefore the BI solutions must change as well or at least be continuously updated. This can be done by conducting evaluations of the solution after it has been implemented. In order for users to be more effective and to efficiently carry out specific tasks in different contexts it is important that the developer knows and understand the characteristics of the user (Smith et al, 2012, p. 590). During the design processes of a BI solution one must apply various methods such as interviews to identify critical features of the human perspective because organisations, users and needs can change. Therefore, the efficiency and relevance of BI solutions are dependent on ongoing evaluation and investigation (Smith et al, 2012, p. 591). In the article by Molensky, Ketter, Bloemhof and van de Koppel (2010) it is found that there is a correlation between the BI tools meeting user requirements and user feedback (p. 125). Suppliers do not apply the feedback achieved from user feedback and evaluations and the BI tool does therefore not meet the user's requirements. The BI solution is not at its full potential and users might not continue to use the solution.

2.7.4 Trust

Trust and validity of data is also important in BI and in order to support decision-making and improve business procedures the data must be of a certain quality and correctness. If not, it is not possible to make good decisions based on the information from the BI solution. Users must therefore also trust the solution. Trust is also identified as one of the determinants of user acceptance of BI (Grubljesic & Jaklic, 2015, p. 304). If one must use the BI solution and solve work tasks with the information or make important business decisions the data must be trusted, and if not, one must assume that the BI solution will not be used. According to Fink et al. (2017) decision-making and managerial discussions has become more “focused, largely due to a greater consensus on the reliability of data” (p. 46). It is therefore very beneficial and important that data

can be trusted to be correct, or at least that users are aware if variables or incorrectness can occur in the data.

2.7.5 Value

The interviews and questionnaire will also focus on the value of a BI solutions, that is, how the user values the BI solution and BI in general but in their own words and experience. Value is as explained unique to each individual, however value in this study is applied because values is required to have success and success must create value. More specifically, value is in this study business value and the how the use of BI solutions in organisations creates value. It is argued that business value is created by those who use the BI solution and that value is dependent on users effective and efficient use of the BI solution to create business value (Tamm et al, 2013, pp. 1-2). As argued by Tamm et al. (2013) it is not the information produced by the BI solution that creates value, it is the use of this information by users that results in enhanced decision making, solving work tasks and business action (p. 2). The focus on users therefore can illuminate some of the unknown areas about users of BI because the users are seemingly an important part of the value creation processes of BI.

In the world of BI, value is also defined as an interdependent term. For example, the relation between organisational resources such as operational and strategic resources are all relevant and determinant in creating value (Fink et al, 2017, p. 14). It is therefore not only the investigation of BI users that could contribute to business value, but several variables that contribute to increased BI value in an organisation. By investigating the users experience of the value of BI solutions it can possibly be argued that it is an important factor to consider that users must value the solution in order for users to use it more efficiently.

Chapter three: Methodology

This chapter discloses the methodological aspects relevant in this study and begins with an explanation of Redmark and how the company functions as a practical example of the gaps and issues identified in literature. Following, the method used to structure the literature review which consist of a protocol (appendix 1) will be outlined. The literature review is a method used to identify the existing and relevant literature on users of BI solutions in organisations. Following the method for the literature review, the research methodology about the interpretivist/constructivist paradigm of this study will be explained and from there elaborate on the use and advantages of both qualitative and quantitative methods. These two methods also include explanations of the methods used to prepare and collect the data for interviews and a questionnaire.

3.1 Case of Redmark

The students behind this study both did an internship in the digital department in Redmark in the autumn of 2019. Redmark is an accounting company that employs approximately 200 people across three departments in Denmark (Copenhagen, Aarhus and Aalborg). Most of these 200 employees are accountants, however, approximately ten people constitute the digital department. Redmark also has many customers, approximately eight thousand. During this internship both students worked with the development of BI solutions in Microsoft Power BI which at that time was a new initiative in Redmark. The purpose of working with BI in Redmark is to develop BI solutions to sell and distribute to customers and support their organisations' business procedures by introducing them to BI. The initiative was and still is positive because of the high number of interested customers and the number of organisations that already agreed to have Redmark develop and design their BI solution. However, it has been discovered during the work with BI that it is a large step from developing and designing a BI solution to launch, implement and maintain the BI solution for the customers. The gap arose when it was clear to the digital team at Redmark that the organisations that were applied to test the implementation of BI solutions were not using the BI solutions in the way that was hoped for and that the user needs were different from what was expected at Redmark and varied from organisation to organisation. At that point the users of BI solutions became very relevant for this study. How could Redmark achieve a more efficient use

with BI for their customers and thereby assist their digital team in understanding the customer organisations and what they expected from BI. At Redmark, BI is a highly acknowledged tool to manage business procedures and enhance decision making and it makes the organisation base their discussions on facts of high quality that can be trusted (appendix 10).

This study applies the case of Redmark as an example of the tendencies and shortcomings discovered in literature. This study is not based on the issues discovered by working in Redmark, however, the study combines the problems within academia to the real-life example of Redmark. It is also possible because of Redmark to possibly conclude something about BI and users in the aspect of the financial sector, which we have not experienced in the literature that was discovered in the literature review. The literature review revealed something about BI and users in other countries and industries and this study might be able to conclude something about BI within the financial sector and/or suggest optimisation requirements according to BI users in organisations in Denmark. Redmark was therefore also a relevant case to include because it is centred about an industry that has not been seen in literature so far. Despite that the situation is experienced in Redmark, it is assumed that other BI developers might experience the same issues or that other organisations seeking to adopt BI could also experience these issues, and it might be possible to suggest after this study that it is important to include users during the entire BI adoption and use process.

The case is therefore related to the experiences Redmark has with BI solutions and users and the issues that presented itself during the process of distributing these solutions to other organisations. During the internship and then the continued work with Redmark after ended internship, the students became acquainted with persons working in organisations that either already used BI solutions for work procedures or were interested in using one. These are the also the respondents chosen to participate in the interviews and survey executed in this study. These respondents work in an organisation where BI is applied for solving or assisting work tasks or where BI is a solution that is about to be implemented. This study evolves around these users of BI and seeks to investigate what users think about BI, their expectations to BI and their experience with BI in their own words. This can assist Redmark in knowing their customers better and thereby creating more efficient BI solutions to customers and achieve knowledge for future BI projects. How respondents were recruited will be further elaborated in this methodology chapter.

3.2 Method for literature review

The advantages of conducting a literature review are many. However, it is imperative to set forth certain criteria for the review in order to achieve relevant and appropriate search results. The search itself can be difficult to execute and it is appropriate and necessary to establish certain criteria for the search as well, in order to have a systematic approach. This study conducts a structured search for the publications to be included in the final review (Gaardboe & Svarre, 2018b, p. 3). The final review is processed in chapter one. This section outlines the entire method of conducting the literature review. Firstly, the section explains the criteria for conducting the search and how papers are included and excluded. Secondly, the dimensions and databases used for the search will be outlined. These preparations will determine which literature that will be included and excluded in the procedure. Lastly, the review will be conducted, and the results will systematically be described.

This study deals with the topic of BI and its users. As explained in chapter one the preliminary thoughts and motivation behind this search was to uncover the area of the end-user of a BI solution in an organisation. The topic was inspired by the work of Gaardboe & Svarre (2018b) who identified gaps in the literary field of BI and the factors that are critical for the success of BI in organisations. Specifically, the article illuminate that users of BI are rarely investigated or deemed critical in the success of BI. The search, therefore, takes its point of departure in users and in BI. To structure the search, it is recommended to apply a protocol. The search protocol is attached as appendix number one (Appendix 1) and developed by Aalborg University. The protocol (appendix 1) outline the criteria for the search and which terms were specifically used to conduct the search to identify relevant publications. To systematically execute the literature review it is separated into different parts.

Firstly, inclusion and exclusion criteria are outlined to know beforehand which literature that will be relevant to search for. The review seeks to find literature on users of BI solutions in organisations. It is important to have outlined criteria for relevant publications clearly in order to include and exclude publications as systematically and consequently as possible during the review process. The criteria should therefore be precise. The inclusion criteria (appendix 1, part 2) therefore directly addresses that the publication must investigate users of BI and view the user as a relevant factor in relation to BI solutions or tools. Despite somewhat knowing beforehand

that literature concerned with the end-user of BI solutions in organisations is limited it is necessary to expose the existing literature surrounding the area of BI and users, which begins with setting up these criteria. This unexposed literary area is one of the important foundations for conducting this study and it must therefore be thoroughly outlined how this area is unexposed and why we need to address it. The exclusion criteria are the aspects of BI that does not concern the user, for example the technical aspect and development. Exclusion also include user articles in some cases because some articles deal with user as the target of BI, but do not include the user as a relevant factor or variable and therefore does not investigate them. The article will therefore be excluded. The standard inclusion criteria are papers and publications in English and Danish published in between the year 2010 to 2020. The time span might be a limitation as a paper may be published in 2020, however, not yet approved for publication by the chosen databases. Therefore, some publications might not be available for reading in full text.

The third part of the method or protocol includes dividing the search into focus areas or dimensions. This search has two dimensions which is BI and users. The search terms were chosen to reflect the aspects of the study which is users of BI solutions in organisations (Appendix 1, part 3). To represent these two dimensions the terms are extended, and other words are included to create a broader search, to include more relevant publications and ensure that the search area is comprehensive. To be able to define the two dimensions it is necessary to conduct several searches with different search terms to settle on a search that provides relevant publications. The terms ‘business intelligence’, ‘bi’ and ‘data warehouse’ were chosen to represent the BI dimension. Data warehouse was included as a term because of the literature review carried out by Gaardboe & Svarre (2018b). Based on their study, it is argued that data warehouse is a synonym to BI (Gaardboe & Svarre, 2018b, p. 3). Based on their experience, ‘data warehouse’ and ‘data warehouses’ are included to avoid missing out on relevant publications. To represent the user dimension ‘user’, ‘users’, ‘end user’, ‘end users’, ‘ux’ and ‘user experience’ are applied to target as many user-oriented publications as possible. The two dimensions are represented in part 3 (appendix 1).

ACM Digital Library and Scopus (Elsevier) represent the databases where the search will be conducted (part 4, appendix 1). ACM represents a large computing society with almost 3.000.000 publications available and therefore an obvious database to search for relevant literature and to represent the field of BI. Scopus is on the other hand, a larger database with a broader field

of academic literature than ACM. Scopus publishes many articles within the scope of global, interdisciplinary scientific data and literature. At Scopus it may be possible to identify publications other than those on the ACM digital library and possibly with a more end-user focus than on ACM. The search terms vary depending on the database. This variation occurs because an identical search differentiates a lot on the databases and the search results are too different in numbers, which is demonstrated in part 5 (appendix 1). It is therefore necessary to modify each search until the number of search results are realistic and the publications seems relevant to the dimensions. As seen in part 5 (appendix 1) the test search with reverse search queries provided many results for Scopus and few results at ACM Digital Library. The search queries are therefore modified and changed and the second search provides more realistic results. The last search conducted on the 24th of march 2020 is applied because the number of publications is enough to ensure that the literary area of BI and users has been covered by this review procedure. The last part of the review process is structured in the table below.

	ACM Digital Library	Scopus (Elsevier)	Total results
Search results	172	486	658
Duplicates	17	17	641
First review: title, keywords, abstract	11	20	31
Second review: full article	3	4	7

Table 1: Review procedure

The modified final search ended up providing a total of 658 search results. ACM identifies 172 publications and Scopus 486. Since the two databases might possibly represent some of the same publications despite the differences of the databases it is relevant to identify duplicates. Combining the two databases 17 duplicates are identified and reduced the total number of search results to 641. These 641 publications are systematically reviewed firstly, by going through title, keywords, and abstract. The inclusion and excluding criteria are outlined in appendix 1, part 2. After

systematically reviewing the 641 publications, 31 publications matched the inclusion criteria, which is 20 publications identified at Scopus and 11 publications identified at ACM Digital Library. Systematically going through the remaining 31 publications require that all the articles are read to see if they continue to meet the inclusion criteria. Two of these 31 publications were published in 2020 and therefore not made public yet by the two databases and have not been through the review process at Scopus and ACM. It is not possible to get access to the full text of these papers and the papers are therefore excluded. This last part of the review process results in 7 relevant studies and publications that discuss or investigate something relevant about users of BI tools in organisations. These seven articles are further explained and investigated in chapter one. These articles help shape the topic of this thesis and enables the possibility to complement the academic area of users of BI.

3.3 Research Methodology

Research methodology is applied to develop instruments that allows for the creation of a model for research to collect and analyse data and enable researchers to study patterns in data, the results and academic literature. It is the main theme of research methodology to set forth a model for obtaining knowledge and to guide your study and to test the research itself. The methodology controls the study with all its advantages and disadvantages. The research paradigm of this study originates from the interpretivist/constructivist paradigm that have the intention of "understanding the world of human experience" (MacKenzie & Knipe, 2006, para. 9). The view of participants or respondents is studied to make meaning of their social reality. However, researchers recognize the impact of their own experiences. This study seeks to investigate and understand the user of BI solutions in organisations and open-mindedly study how users perceive a beneficial use of BI solutions in relation to daily work tasks. However, the researchers of this study include their own knowledge about users and BI and compare this knowledge to the data collected about users. The interpretivist/constructivist paradigm allows for the study of users in order to understand them, their needs and opinions while, at the same time, achieving interesting results because of the impact and comparison with the researchers' knowledge of and experience with the topic of BI and users (MacKenzie & Knipe, 2006, para. 9). This paradigm is therefore the instrument that allows for the type of data collection that will be elaborated during this entire methodology chapter. The interpretivist/constructivist research methodology applies an inductive method to "develop a

theory or pattern of meanings". This study began with the knowledge that literature and studies of users of BI solutions in organisations was a largely unexposed area. From there, the study developed into a research that wanted to understand the "human experience" of the users of BI.

Data analysis can be a difficult task and therefore it is highly necessary to manage the process. For the collection and analysis of data the previous dichotomic perception of qualitative and quantitative method is dismissed and the benefit of mixing the two is applied in this methodological research approach (MacKenzie & Knipe, 2006). Today, social scientists acknowledge the combination in order to make use of the "most valuable features of each" (MacKenzie & Knipe, 2006, para. 2). The interpretivist/constructivist approach is characterized by its mixed method by combining qualitative and quantitative methods. The quantitative data is usually applied to support or expand "upon qualitative data and effectively deepens the description" (MacKenzie & Knipe, 2006, para. 9). This study applies this approach by also mixing qualitative and quantitative methods to achieve meaningful results. The qualitative interviews of this study will be the main resource of the data collection and the quantitative survey-based questionnaire will supplement the findings from interviews to represent both numeric information and text information about users and identify similarities and differences in the results.

The research paradigm of interpretivist/constructivist also set forth guidelines for the strategy of analysis later in the project. The paradigm require that participants or respondents must be understood and interpreted. That means that this study must make meaning of the data that is collected by use of interviews and a questionnaire. The analysis must identify the reality of the users and their experience and interaction with a BI tool. It must then be put into the perspective of the researchers experience of users, BI and literature. By doing so, it is possible to achieve meaningful results by using the interpretivist/constructivist paradigm.

On the other hand, it is still relevant to explain each concept individually as the methods that relate to either qualitative or quantitative research is outlined separately however, it will all collectively enable this research to have a meaningful discussion and achieve meaningful and interesting conclusions and findings for future research. As a part of the methodology of this study it seems worth mentioning that this vast area of BI, organisations and users is still so unexposed that this study functions as complement to the academic literature on BI and not as a complete study of users of BI.

3.4 Qualitative and quantitative research

According to Olsen (2003) disagreement and differences exist within the field of qualitative research. However, two themes are key for the application of qualitative research, especially when it comes to working with the results of an investigation. Opposed to quantitative research methodology, qualitative research does not have specific guidelines but more interdisciplinary strategies (Olsen, 2003, p. 69). These two themes are analysis and interpretation. For this study the two terms are to be understood in the following way: analysis is the investigation that leads to the identification of patterns, themes, and issues that are discerned in the data and when these findings are seen in relation to one another and against larger theoretical perspectives we will refer to it as interpretation (Olsen, 2003, p. 71). This understanding will be applied as a guideline throughout the analysis, discussion and conclusions of this study based on the patterns and themes identified in the data collection.

Tracy (2010) participate in the discussion of how to produce qualitative research in high quality. Instead of using specific criteria that could ensure qualified qualitative research that rule out other possibilities for qualitative research, she argues that it is more effective to combine conceptualizations from all the different paradigms of qualitative research and apply these combined conceptualizations. The research includes many different scholars within social research methods and qualitative research and Tracy (2010) combine the most important concepts into her eight conceptualizations for good qualitative research (pp. 840-849). These eight concepts are also considered during the qualitative data collection. As a repetition from Olsen (2003), Tracy (2010) also emphasize topics such as transparency and bias i.e. sincerity (Tracy, 2010, pp. 841-842). Furthermore, she emphasizes that it is important to have a worthy topic. This study is conducted based on the knowledge that BI solutions in organisations is a hot topic (Gaardboe & Svarre, 2018b, p. 1) and an unexposed literary field regarding the users of BI solutions in organisations (chapter one) which makes this qualitative research relevant. The qualitative method is mixed with the quantitative method as qualitative method makes it possible to further investigate words and more specifically interpret the words the users use about BI and its value to them. This in-depth explanation is exactly the reason why it was necessary to include qualitative research in this project, as it allows for more concern of the words instead of numerical value (Bryman & Bell, 2011, pp. 386-387). It is a critical contribution to this study to have included qualitative interviews

in order to thoroughly support our thesis, findings and conclusions. However, it supplements this study even further to also have included quantitative research.

According to Bryman (2012j) quantitative research can be described as a research strategy that focuses on quantification in the collection and analysis of data (pp. 35-36). Quantitative data will typically be a strategy that entails an inductive nature in comparing theory to research, and therefore focus on the testing of theory to data. Quantitative research seeks to hold social reality as an external, objective reality. Based on Bryman (2012j) quantitative research is established to be a research strategy that would benefit this study as it enables larger quantities of data collection while not sacrificing the quality and usefulness of these data. The means and motive of this study is to examine the interaction between the user and BI solutions in organisations, therefore it becomes imperative for this study to include data gathered from as many users as possible which is enabled by using a quantitative research strategy. Furthermore, it is argued by Bryman (2012d), and as argued earlier by Mackenzie & Knipe (2006), that the dismissal of a dichotomic perception and the inclusion and usage of qualitative and quantitative in a mix can lead to great impact and benefit for a study (pp. 649-650).

Another preeminent reason for the inclusion of quantitative research is the appropriateness of conducting a survey-based questionnaire. The questionnaire was early on determined to be one of the approaches used to gather data from users of BI solutions. The questionnaire can allow for more concrete and measurable data about the users and create an insight into BI as a tool for daily work tasks and users experience with development, education and implementation of such a solution. In “Developing a Questionnaire” Gilham (2008, pp. 1-3) outlines that questionnaires function as a controlled element and entity, meaning that possible answers of the respondent will already have been outlined by the researcher. However, Gilham (2008, pp. 6-8) argues that this, although it cannot be dismissed, can be rectified by the benefits that a questionnaire can provide for a research project. Gilham (2008, pp. 6-8) further argues that benefits of a questionnaire are the lack of interviewer bias, standardized questions, respondent anonymity, etc. However, the main benefit of a questionnaire is that it helps provide a large data set that can easily be compared or analysed against a specific hypothesis or theory. This claim is also supported by Bryman (2012j) where he too, argues that a questionnaire is an effective way of gathering large quantities of data to analyse a hypothesis or theory (pp. 14-15).

To sum up the explanations of the use and benefits of qualitative and quantitative research, these methods are applied to create a strong research foundation for this study and to achieve qualified data from the empirical data collection in order to achieve meaningful and well established results. The qualitative and quantitative research methods complement each other because it creates the possibility to analyse and interpret words directly from the user to achieve a meaningful idea about the value of investigating the users of BI solutions in organisations. Moreover, quantitative research makes it possible to collect more data, controlled by the researcher which can be investigated closely in relation to theory and presuppose good conditions for comparing results and analysis.

3.5 Interviews

The qualitative part of this study consists of two different interviews. To ensure qualified qualitative data some aspects of the empirical foundation for the interviews are carefully considered, as argued by Olsen (2003). One important aspect that is considered is the transparency of the interview (Olsen, 2003, p. 93). It is important that the questions and the dialogue during the interview is always related to the main focus of this study, both to ensure that crucial knowledge is obtained and that the interview respondents also feel that the questions are appropriate and relevant in order for them to provide a good answer. One of the strategies to ensure transparency during the entire interview is to develop an interview protocol (Appendix 6) and guides (appendix 7 and 8) as further elaborated below. Many of the questions are developed based on theoretical knowledge, inspiration from other studies and structured based on knowledge from social research methods which can be seen in the theory section and in the interview guides.

As mentioned, two different interviews (appendix 7 and 8) will be developed and executed. The one interview focuses on BI and its potential from the perspective of a distributor of BI solutions. This interview is developed to clarify the intention behind the development, implementation, use and benefits of BI solutions in organisations from the perspective of the distributor. The purpose of this interview is to understand the experience with BI and why other organisations may benefit from using BI and which factors that contribute to an efficient BI solution as opposed to these experiences directly from the user. The interview functions as a supplement to the arguments identified in literature that explains the many benefits of BI and how it supports decision making. This BI interview is also an inspiration to identify and understand

which themes the distributor of BI solutions consider and value. To clarify, this interview is only carried out with one respondent (appendix 7 and 10).

The other interview is developed with the purpose of answering the research questions. This interview (appendix 8) is targeted towards users of BI which is investigated in this study and the questions are focused with topics from theory to illuminate which values and factors that are important for the user to make most use of a BI solution to solve work tasks. The users experience with the BI tool regarding training, participation and evaluation is discussed and furthermore, how the users experience the BI solution regarding potential, benefits and value in the organisation that the user is employed in. This is a user-centred interview that will be used in the data analysis to argue how users play an important role when arguing that BI is an efficient, beneficial tool to use in organisations for optimising decision making and earning profits. The interview goes through topics such as familiarity with BI, use of BI and for which tasks, how much time or how many work tasks the user estimates that BI is used for and the users experience with the implementation process, training, trust and general value. This interview is carried out with four anonymous BI users from three different organisations.

3.5.1 Semi-structured Interview

The semi-structured interview (SSI) is a qualitative research method that according to Adams (2015) enable what they lack in breadth they make up in depth (p. 492). This study includes five SSI's, one interview about the BI tool with one respondent and another interview about use of BI with four BI users. See appendix 10, 11, 12, 13 and 14. Qualitative interviews are not always strong in numbers but are designed to achieve broad and in-depth knowledge about a topic by having a conversation with one relevant respondent at a time. The semi-structured dialogue is a combination of closed- and open-ended questions and typically deals with topics prepared beforehand by the interviewer. The SSI makes it possible to deviate from the agenda and dive into unforeseen issues related to topic. One hour is considered maximum length for the interview which is a priority for interviews conducted in this study (Adams, 2015, p. 493). An attractive feature of the SSI is the possibility to have a dialogue not only controlled by the interviewer. It is possible to ask clarifying questions and obtain knowledge about something unexpected during the interview. Moreover, you achieve knowledge about the respondent's independent thoughts and experiences about your topic (Adams, 2015, p. 494). As a part of a mixed methods research, the SSI's are used to gain more

important and in-depth information users of BI and achieve knowledge about personal experiences of the daily work with BI solutions (Adams, 2015, p. 494). One of the reasons that SSI's are not conducted with many people is because the method is time consuming. Preparing the interviews, setting up the interview, conducting them, transcribing and analysing them are all time-consuming processes (Adams, 2015, p. 493). The study therefore only includes four SSI's with users of BI but supplements the study with a questionnaire as questionnaires are more tangible to collect and analyse. The SSI on the other hand presents another more interactive and flexible approach (Adams, 2015, p. 496). It would have been beneficial to have been able to conduct more SSI's with users of BI, it is however concluded that these interviews can establish a thorough impression about the users and meaningful results can be achieved, especially since this approach towards users and the investigation of these in relation to BI is lacking within the literature (chapter one).

A part of preparing a SSI consists of search and perspective before developing the interview. According to Brinkmann & Tanggard (2010) it is important to research what already exists about the topic and how interviews related to the topic are compounded (p. 37). By composing and conducting a literature review and combining different theories in the theory chapter the research impacted our interviews and the way questions were composed. Another part of preparing the interviews involve the development of an interview protocol (appendix 6), and two interview guides; one for the BI user interviews (appendix 8) and one for the interview about BI (appendix 7) to ensure that the interviewer is thoroughly acquainted with the questions and why they are asked (Adams, 2015, p. 502). There is no formal pilot testing planned for the SSI's, however, the interviews are considered a work in progress as argued by Adams (2015, p. 499). Moderations may be made after the first interview, however the SSI approach is adopted by the interviewer and moderations to the interview might also be made during the interview because the flow of the interview and the questions depend on the answers provided by the respondent (Adams, 2015, pp. 498-499). The interview guide functions as a guideline for the interview and transcription of interviews might therefore vary or deviate from each interview and from the interview guide. For example, the first interview with User 1 (appendix 11) is asked if he collaborates with a company on the development of a BI solution for his workplace. The other BI user interviews (appendix 12, 13, 14) are not asked this question because it is known beforehand that the BI solutions at their workplace has been implemented for a longer period. After having conducted the interviews, only a few moderations such as the example just mentioned were made.

Adams (2015) recommends beginning the interview with a few easy questions to start a relaxed dialogue before asking the more serious questions (Appendix 6, 7 and 8). Positive inquiries such as "Hvilket potentiale ser du i BI for din arbejdsplads?" (appendix 8) are one of the first questions asked to ensure that the respondent share their positive thoughts first, which makes them more reluctant to share critical or negative thoughts later during the interview. It is also considered during the development of the interview guides to ask neutral questions in a non-judgmental tone (Adams, 2015, p. 498).

The interviews are mainly concerned with users of BI and their experience with different BI solutions in organisations. Naturally, the questions therefore reflect this theme and the goal of achieving more knowledge about user of BI solutions. One of the five qualitative interviews is concerned with the potential of BI from the perspective of an employee distributing BI solutions to other companies. This interview illustrates this specific employee's initial thoughts on users of BI solutions. The four remaining interviews are conducted with users of BI solutions and their experiences (explained further in section 3.5.2). To establish the most trust between interviewer and respondent to hopefully achieve the most useful data to investigate, the interviewer who has been in most contact with the respondent conducts the interview. This also further elaborated in section 3.5.2.

Interview guides and protocol are also used in this thesis because it is important to structure the data gathering to ensure that the same procedure is followed during each interview. This structure is also applied when transcribing interviews by using a transcription key (Appendix 9) to ensure all interviews are transcribed by the same rules and that the same sounds and pauses are included. The qualitative data gathering is developed from the method of SSI's and adopt the method of interpretation and interactive dialogue. The SSI method is in this study practiced using interview protocols, guides, transcription keys and the flexibility of the interview.

3.5.2 Recruitment

A part of collecting data and conducting interviews naturally require respondents or participants. The basic requirement for recruitment is that "anyone for whom the topic is relevant can logically be an appropriate participant" (Bryman, 2012b, p. 509). The respondents recruited for the SSI's with BI users are recruited according to a convenient sample strategy. This means that respondents are chosen based on their potential and convenience within the proximity of the students behind

this project. Another characteristic that agree with convenience sampling is if recruiting occurs when potential respondents are located and fit the required criteria for respondents. Then, respondents are recruited on behalf of who agrees to participate in the interview (Robinson, 2013, p. 31-32). The case description further describes how the students became acquainted with respondents, but it is also elaborated further below.

However, it must be explained that it can be problematic for a qualitative study to apply convenience sampling as a recruitment approach. Robinson (2013) argue that the sampling universe is too broad and therefore "unwarranted generalisations may be attempted from a convenience sample" (p. 32). It is important to be attentive towards this danger, however this study does not attempt to make generalisations about users of BI and conclude that this study can generally prove that it is necessary to investigate users and conclude them as an important variable regarding efficient and successful BI solutions. Users are investigated to understand their experience with BI solutions in organisations and whether the users included in this study deem certain factors important to have a valuable and efficient BI solution in the organisation. This study might be able to initiate further investigation about users of BI because this study may be able to imply that users have an important role to play within successful BI solutions in organisations. However, it is important throughout the analysis, discussion and conclusion to emphasize that this cannot be regarded as a study that can generalise about users of BI, but still seeks to become acquainted with the users of BI and their experiences and opinions to elaborate on the unexposed field of BI and users.

The study includes five SSI's, but one of these five interviews will not include a user of BI as respondent. This interview will be conducted with a respondent from the case example of Redmark (Appendix 7 and 10). The respondent is an employee at Redmark and is the main responsible of the BI area. The interview is mainly concerned with other organisations and how these organisations can benefit from implementing BI in their organisation and how the respondent thinks the process of implementing and using BI should be. Recruiting the employee from Redmark was relevant to establish our study and case example.

Redmark is also used to recruit respondents for the BI user interviews (appendix 8, 11, 12, 13 and 14). As explained in the case description, during an internship the students became familiar with many organisations that wanted to implement a BI solution or that already used BI. Therefore, the interviewers have been in contact with relevant respondents several times and

respondents are familiar with the interviewers. The sampling strategy is convenience sampling. In order to convenience sample it is necessary to outline certain criteria for recruitment. However, the criteria for the recruitment of respondents for user interviews are fairly simple. Respondents must work in an organisation that employs BI for daily purposes such as decision making and/or monitoring and be one of those employees within the organisation that uses BI for these purposes for example. BI developers within an organisation is excluded. The inclusion criteria are therefore the end-user of the BI solution, the employees that uses the data analysis function of BI to act within the organisation. The size of the organisation, the number of users of BI within the organisation or the amount of time that BI has been used or implemented is not included in the recruitment criteria for the study. The type of organisation that respondents works for is also irrelevant because the user of BI in an organisational context is the main focus. Respondents participate voluntarily and is contacted by interviewers by phone or email beforehand. Respondents are collected conveniently based on the contact established via Redmark and it is the experience of end-users of any BI solution in an organisation that is investigated.

3.5.3 Research setting

The qualitative perspective of a study can be particularly useful because qualitative research has the possibility to disregard some of the bias that researchers have and sometimes impose on participants or respondents (Bhattacharya, 2008, p. 788). The main purpose of qualitative research is interpreting a meaning from what is experienced, and the research setting refers to the physical setting of the interviews. It is argued that the interpretation of interviews is most meaningful when participants are studied in their natural settings (Bhattacharya, 2008, p. 788). It is an important priority for this study to conduct interviews in the natural physical setting of the participants, because it might affect how comfortable respondents are during an interview. However, it is unfortunately not possible to conduct more than one of the BI user interviews (Appendix 11) in a physical setting.

Only one interview will be conducted at the respondent's workplace. The rest of the interviews will be conducted via phone or video call. It is not necessarily a disadvantage if interviews are conducted by phone. Respondents might feel less distressed about answering questions since the interviewer is not physically present (Bryman, 2012c, p. 488). There has been identified some differences in the responses of face-to-face interviews and interviews by the phone, however, none that makes it impossible to execute qualitative interviews over the phone.

Though, it is necessary to be aware that the interview should not be too long as it is easier during a telephone interview for the interviewee to terminate the interview. It is also important to be aware that body language and vocalized responses are difficult to include (Bryman, 2012c, p. 488). The interview with the BI users includes twenty-two questions and is kept somewhat short. It is difficult to keep a SSI short which is also not the intention, however, the qualitative interviews do not include many questions and are therefore more suitable for telephone interviewing. Some of the BI user interviews will also be conducted by video call. The video call include some of the same difficulties as with the telephone interview, however, it is possible to see the respondent and observe some body language and silent nods to show that what is being said is understood, which is an advantage. It must on the other hand, also be considered that not all respondents are comfortable on video calls.

Interviews are planned and executed by agreeing on time and date with respondents separately. Each interview is carried out at different dates to ensure that the interviewer can stay focused on the one interview and the answers. The interview is conducted by the interviewer that is most familiar with the respondent and the organisation and then transcribed by the other student behind this current project. One of the interviews with a BI user is executed in a physical setting at the respondent's workplace. For this interview the interview protocol will be applied (appendix 6). The rest of the interviews (both the interview with a Redmark employee about BI and the three remaining BI user interviews) will be conducted by phone or video call. The physical setting is therefore for most of interviews an "online" setting. For the online interviews the interview protocol is also applied.

The research setting for the execution of the qualitative interviews are different and only one interview is conducted where both interviewer and respondent is physically present. However, it is not seen as a disadvantage or issue for the quality of the interviews that the majority of interviews are conducted by phone and video call. It is merely required that interviewers are aware of some of the differences that exist between the different kinds of settings of the interview.

3.6 Questionnaire

The focus of the questionnaire is to investigate the user and his experience with BI as a tool, and furthermore examine whether the user has experienced any training in using BI, whether the user has had a say or been a part of a development and/or implementation phase, and the potential and

value of BI for the user and his work tasks. This has been done to test whether user input can be used as a valid argument in the succession of a BI solution as well as examining if the initial benefits of BI solutions (Fink et al, 2017, p. 39) cohere with the opinion of the user. The questionnaire will assist in providing valid data to examine which perspectives from the user can contribute to efficient and valuable BI solutions. The questionnaire focuses on three types of data collection: user input, the use of a Likert scale and a dichotomous data collection of yes and no answers. The questionnaire can be seen in appendix 2 and 5.

User input are questions where the user gets to elaborate on his thoughts on a specific question or the context of the question, and how he perceives what is being asked for. Sridhar (1995. pp, 157-158) argues, that this must be a part of any good data collection in surveys or questionnaires, as it enables the questionnaire to become more individual to the specific respondent, and for them to feel comfortable with their answer. As mentioned previously, the questionnaire seeks to uncover the different opinions of the respondent towards BI solutions in an organisation and the processes involved in and during the implementation of a BI solution. Therefore, the questionnaire enables the respondent to give more elaborate answers on certain topics. User input questions, and the collection of this data ensures that the questionnaire yields data that can be compared to other answers given in the questionnaire as well as ensuring no misunderstandings in the analysis of the data regarding these opinions. User inputs is used for respondents the elaborate on themes such as follow up and potential of BI solutions (appendix 2, question 16; 22; 23).

The Likert scale is a data collection tool that can be used within a questionnaire, because it is used to measure intensity of feelings about the topic (appendix 2 and 5). The use of Likert scale within the questionnaire stems from the description and arguments made by Bryman (2012f, pp. 165-166). Bryman (2012f) argue, that the need for a multiple indicator measure can be critical in ensuring proper data collection as it is very much a possibility that a single indicator will incorrectly classify or assess many of the individuals involved in the questionnaire, where as a multiple indicator measurement will, to an extent, ensure that the respondent will not be misclassified (pp. 165-166). Furthermore, it is argued that it is possible to make much finer distinctions between answers given in a questionnaire. Multiple indicators make it possible to more accurately measure the opinions and feelings of users of BI solutions. Multiple indicators are important for the ability to correctly classify and represent the individual respondents because the

questionnaire will be distributed to different respondents all from different backgrounds, work expertise, experience and opinions. To correctly represent and classify them a multiple indicator measure like the Likert scale was deemed necessary. The Likert scale is applied on many of the questions for example in question 10, 11 and 18 (appendix 2).The argument of a multiple indicator measure being able to yield result of finer distinction was again seen as important to the study as this ensures that although the field of respondents is wide it would be possible to make distinctions in the data collected and to separate and validate the coherence and incoherence in the collected data.

Bryman (2012h) argue that in order to gain background information that can later be used to understand other answers given are most efficient when following a dichotomous pattern (pp. 335-336). This essentially means that it is a question with only two variables that are weighted equally. In this questionnaire it is yes or no questions. These are a vital part of the data collection as they help to interpret answers and the possible explanations for these answers. These types of questions help determine experience level, the length of work with BI and the quantity of work with BI, and becomes vital to later understand questions on expertise level, and feelings towards bias of a tool in general, as they tend to interpret whether there is coherence between the length and quantity of something with the emotion towards it (appendix 2 and 5).

3.6.1 Sampling and distribution

The target respondents for the questionnaire is relatively broad with only one precedent to determine and distinguish who will be a valid and plausible survey respondent. Respondents must have a level of interaction with BI and therefore also a level of experience in working with it as a work tool. BI can be used as a tool on many different levels as a CEO to working in a call centre. The means of the individual BI solution will not be seen as important within the sampling, the focus is to find respondents that rely on BI solutions to solve some of their work tasks. Within this it is important to note that although this is found to be the only precedent it is with the idea of the user and not the developer in mind i.e. data from BI developers is not relevant for the study but more so the user of the BI solution in an organisation.

In Bryman (2012i) the idea of convenience sampling is introduced alongside many other sampling methods (pp. 201-202). However, the idea of convenience sampling is determined to be the most optimal basis for the user sampling in this survey research. Bryman (2012i) argue

that convenience sampling is a sample made from the strategy of convenience and by extracting data from the population available to the researcher. Bryman (2012i) argues that it can be impossible to make generalisations based on such a sample (pp. 201-202). However, by applying a precedent like the one previously described, this enables the sample to explain certain levels of generalisations. Although our lack of a more specific precedent can be seen as a possible source of error, it is believed that focusing on a wider perspective will give more general data that in turn can be used towards answering the problem formulation as well as forming and informing the critical analytic part of the study. In example one could take the issue of whether the user has had a say in the development process of the specific BI solution and if this has an impact on the user. On this it is determined that by holding a wider perspective this will yield results from both users with and without a say in the development process. This is in contrast with the risk of minimising the result by holding a narrow and strict sample method with multiple precedents for the plausible respondent. Different forms of sampling errors are presented and argued, in this study the sampling is convenient to minimise errors in the collected data and have as many relevant respondents as possible to the questionnaire. Bryman (2012i) argue, that by taking a precedent one can minimise the sources of error within both the respondent sampling and the data collected (pp. 189-190).

Regarding distribution, in order to gain as many respondents as possible within the given precedent a social media outlet is optimal. The social media outlet LinkedIn is chosen. LinkedIn is chosen because it is a somewhat professional and work oriented social media outlet and therefore the chances of finding professionals who are working with BI is increased (Molensky, Ketter, Bloemhof & van de Koppel, 2010, p. 120). This method of distribution also follows the idea of convenience sampling, as it will only be distributed to users conveniently available to the researchers as well as the personal contacts. However, the software chosen to provide the questionnaire ensures that only relevant respondents can complete the questionnaire. This is done via validations; this idea will be explored later in this section. The study can rely on this form of convenient sampling and distribution due to the co-operation with Redmark. Redmark functions as a BI consultant and developer for many companies, this co-operation therefore enables the study to create a network of respondents that use and work with BI daily. The aspect of convenient distribution with Redmark as a co-operator enables the study to validate that the respondents are in fact in line with the predefined precedent.

The software chosen to distribute and collect the data in the survey is SurveyXact. The technical setup in SurveyXact is simple and straightforward. However, in relation to what is described in the previous section about the precedent of the sampling it is important to be able to distinguish between respondents based on this precedent. This is achieved in SurveyXact by using a specific validation which means that if a respondent answers "yes" to the question of whether the respondent is employed in an organisation that uses a BI solution and "yes" to the question of working with BI then they will be enabled to answer the rest of the survey (appendix 2, question 1 and 2; appendix 5). If a respondent answers no to any one of these questions the respondent will be excluded from the rest of the questionnaire. By applying this validation within the software, and simultaneously making use of the network created as an effect of co-operating with Redmark, it is possible to make a convenience sample more strategic and in turn enable the generalisation of data collected (Bryman, 2012i, pp. 201-202).

The sampling and distribution strategy is a convenient sampling for the reasons stated above and in previous sections. The work experience gathered from the build-up to this study enables the study to make use of a convenient group of people and a network that consists of the members of the population that is sought after within the study. The study will benefit from this as it allows the study to be directed at a specific target audience that fit in to a predefined precedent of plausible respondents.

3.6.2 Piloting the questionnaire

According to Bryman (2012a) it is always desirable to conduct a pilot study before distributing and activating a questionnaire (pp. 263-264). This is not only desirable in order to ensure that questions are asked in an understandable manner but also to ensure that the instrument or software in this case SurveyXact, functions well and as planned. Pilot testing in this case is also found to be of great importance as the survey is in the form of a self-completion questionnaire meaning that all questions and functions must work properly without an adjudicator or interviewer present, in other terms it should be intuitive to answer. Another point towards the decision of including pilot testing is the argument presented by Bryman (2012a) that a self-completion questionnaire typically will reach a larger number of respondents and therefore the wastage if something is misunderstood will be considerably higher (p. 263). Pilot testing enables us to ask more open questions that later could inform more closed questions, and moreover enables us to understand if certain questions or

phrases made the questionnaire undesirable to answer, which in turn will help minimise the wastage in collected data. The pilot study is intended to make use of two pilot testers. One test person is very experienced with the development of questionnaires and working with SurveyXact and the other an expert in BI with a lot of experience in developing BI solutions and implementing them with customers. By determining that pilot testers fit the precedent this will assist in narrowing down errors that might affect our target respondents. Simultaneously one of these testers will have an actual knowledge of BI and will therefore be more informed about specific phrases and technical terms about BI and the feedback from this person will reflect our target respondents. The questionnaire is edited and modified based on the feedback from test persons and can be seen in appendix 2, 3 and 4.

The pilot testing of the questionnaire ensures that errors are avoided when it is launched and distributed to respondents and ensures the most optimal responses and data to investigate afterwards. The pilot testers were experts within their separate areas which ensures that both functionality of the questionnaire, and the flow and quality of questions is adapted and appropriate. The expert on questionnaires and SurveyXact also comments on the questions and the topic of BI although this person is not familiar with using BI, this ensures that respondents would not misunderstand any of the questions.

3.7 Data analysis strategy

The study will generally take a inductive approach in that it will start with observation before theory. However, the coding of data found in both the questionnaire data and the interview data will follow a deductive approach Bryman (2012g, pp. 568-569). This deductive approach to the coding of data enables the researcher to select core categories from theory that the study in turn will evolve around, these categories will all be bound to the central concept of the study “Users in BI”. Within a typical inductive study, it would be sound to employ coding categories found in observation or data collection, and although this study has found its core categories within theory these categories are also made use of within both observation and data collection. It should be noted that an inductive coding approach will also be followed should the data collection reveal new areas of interest that benefit and contribute to the overall idea and concept of the study. The coding scheme will be presented within the section of empirical findings located before the analysis chapter, in order to outline the coding scheme before starting the analysis. Within this

scheme the core categories and subsequently the additional categories of this will also be presented.

3.7.1 Qualitative Data Analysis

The method for the qualitative data analysis within this study can comprehensively be understood as a data analysis method which enables the research to ground its theory in data, in this way a the data analysis method, despite the lending of a deductive approach in coding, becomes almost synonymous with an inductive approach (Bryman, 2012g, p. 568). Within an inductive approach to data analysis, it would typically be argued that the study will seek to saturate a topic to a relative absolute. This study does not necessarily rely heavily on saturation. The idea of saturation within this study and its use of an inductive analysis approach is to be understood in the way that the categories and additional categories found to be of core importance will be saturated to the point where they become informative to the study and the problem formulation. Despite the differing approaches within an inductive approach to data analysis, Bryman (2012g, p. 568) argues that there are a set of procedures that can be followed as a guideline to the general approach.

Saturation is a procedure used in inductive approaches that describes the importance of the collection of data and the further work with the data once collected. In essence theoretical saturation means to collect, categorise and code the data according to the thesis or problem formulation of the study in such a way that it leaves no gaps in answering or concluding the thesis or research questions (Bryman, 2012g, p. 569). Within this study saturation is to be understood similarly to the concept of saturation as explained in the previous section. Saturation will be done to the point where the collected data and the coding of this becomes important, relevant and informative to the overall study and research questions. Theoretical saturation will in turn focus on exactly this but with the research questions in mind as to saturate this via the encoded data.

Comparison is an aspect of inductive approaches that is implicit with conducting data analysis. It emphasises the significance of continuously holding a close connection between data, theory, conceptualization and problem formulation. Constant comparison enables a study to go in depth with new emerging issues or areas of interest during data analysis work (Bryman, 2012g, p. 569). Constant comparison will serve as the tool that will ensure that all analysis work done will continuously compare the encoded data to theory, literature and problem formulation.

3.7.2 Quantitative Data Analysis

Univariate analysis is a concept and approach that is typically assigned to quantitative statistical analysis. Univariate is simply the analysis of one variable at the time. Univariate analysis analyses one variable at a time in order to saturate that variable to an extent where the findings can be used in comparison (Bryman, 2012h, p. 337). Within univariate analysis there a different tools and measures that can be followed in order to analyse data. We intend to use it to saturate each variable for later comparison and not as statistical.

Frequency tables and diagrams are tools of univariate analysis that uses tables and diagrams. Frequency tables take the variable in question and examines how many respondents fit into each category of the set variable and hereafter provides the percentage of this distribution. Other attributes can be added this, such as age, however attributes most have extensive relevance for the variable to be included (Bryman, 2012h, p. 337). Within this study frequency tables will be used to outline the answer percentage for different variables in order to examine the patterns of a set category. These variables will relate to variables such as experience, training, implementation, development, benefits and constraints. Diagrams are one of the most frequently used tools in visualising quantitative data. Within the genre of diagrams there many ways to visualize the data, two common types of data visualisation are bar charts and pie charts (Bryman, 2012h, p. 338). These two types will be employed in this study. Data visualisation within this study will serve the purpose of supporting the frequency of answers within categories and enable the data to become more tangible, comparable and interpretable.

Central tendency is an aspect of quantitative data analysis that enables the analysis to find the average of a sum. It is important to note that within quantitative data analysis three types of averages are recognised as valid averages. Arithmetic Mean, Median and Mode are all types of average calculations (Bryman, 2012h, pp. 338-339). Within this study the idea of calculating an Arithmetic Mean will be employed. Arithmetic Mean is the average as it is understood in general, the calculation of a total sum divided by the number of accounts (Bryman, 2012h, pp. 338-39). However, the study will rely on finding the Median as well or at least employing strategies from Median calculation. Arithmetic Mean or normal average will have a vulnerability to extreme outliers, whereas a Median calculation will include these. As the study seeks to explain the importance of users in BI solutions it is concluded to be of importance that all answers are examined not just by the normal average. Doing this will help provide ideas of patterns

within answers and check if the overall conclusion by user towards BI is the same or vastly different.

Dispersion is to some extent the opposite of tendency; it seeks to find the amount of variation within a sample. There are methods to dispersion, within this study the analysis of dispersion will be in Range (Bryman, 2012h, p. 339). This is the analysis of the difference between the maximum and minimum value in a category. Dispersion is interesting as it will enable the study to locate patterns in user answers concerning BI solutions.

Overall, the quantitative data analysis within this study should be understood as a method or strategy to support or question patterns found in qualitative data, whilst facilitating in depth critical analysis of the findings. The data analysis will overall help inform both analysis and findings.

3.7.3 Overall Conceptualisation of Data Analysis:

The overarching idea of the data analysis section is to use methodology of qualitative data analysis to analyse and interpret findings within the data collected. Analysis will enable identification of patterns, themes and issues within the data, and interpretation the large-scale comparison of these findings in reference to both theory and research questions (Olsen, 203 pp. 69). Methodology of quantitative data analysis will enable the study to find conclusions within the quantitative data as well as supporting the patterns found in the qualitative data. Furthermore, it enables the study to constantly refer back to the problem formulation and theory to investigate the legitimacy of the problem formulation (Olsen 2003, pp. 71). Although the aspect of quantitative data analysis can be described as being deductive, as it seeks out to test theory, the overarching foundation for the data analysis will be an inductive approach as the study intends to observe first and theorise last (Bryman, 2012j, pp. 24-25) as is also most natural to the overall interpretivist/constructivist paradigm.

3.8 Interplay in methodology

This methodological chapter outlines the entire practical method for executing interviews and questionnaires. By adopting the interpretivist/constructivist approach to experience and understand a human reality and analyse and interpret this human experience, it is possible to apply qualitative and quantitative methods to achieve this understanding. These methodologies complement each

other and create a foundation for achieving meaningful results from both a questionnaire and interviews and interpret the patterns identified in data to study which themes are important for users in the use and adoption of BI solutions in organisations. The methods within both qualitative and quantitative strategies ensure valid, trustworthy and useful data and results with a low probability of errors. The method for the literature reviews as well ensure the consistency of executing the review and that results are useful. The review has made it possible to narrow the theme of this thesis and specify which methods were relevant and useful for this study to apply. The case of Redmark also functions as a practical example of the study and that the issues also exist in organisations in Denmark. The methodology chapter therefore outline imperative requirements for this study to have solid and valid methods for the collection and management of data. It does not necessarily mean that results are precise and correct, errors may occur, however, following methodological criteria ensure that certain requirements and guidelines have been applied and that results are not biased and with least possible errors. The adoption of the interpretivist/constructivist paradigm and the mixed method use of qualitative and quantitative methods also makes it possible to outline methodological requirements and guidelines for the analysis and to create a strategy that is also explained in this chapter. The methods outlined in this chapter are therefore interrelated and none of them could stand alone without one another and without having serious implications for the results and validity of this study.

Chapter four: Summary of and interplay between introduction, theory, and methodology

This short chapter summarises the previous three chapters and the most important aspects presented in the introduction, theory, and methodology. It furthermore emphasises, how these three chapters interplay and are dependent on each other to achieve useful results and have a meaningful discussion about the role of users in the efficient use of BI solutions in organisations.

4.1 Summary and interplay

By the execution of a literature review as explained in the introduction (chapter one), the academic gaps about users' role within the success and value of BI solutions in organisations is outlined. The introduction establishes the entire problem area of this master thesis, which is about highly regarded BI solutions in organisations which facilitate and optimise decision making and business procedures but is problematised because the value factors and CSF for BI seems somewhat unidentified regarding users and the variable the users constitute in this context. The role of users is undefined and different scholars allocate different value to the role of the user within the successful implementation, adoption and efficient use of BI solutions in organisations. The literature review reveal that the role of users have rarely been investigated in relation to the success and value of BI systems and that interviews with active users of BI solutions in organisations have not been conducted many times. The review also suggest that more thorough user studies should be conducted in relation the success of BI. The study therefore takes its point of departure in these gaps and outlines the theoretical foundation for this study which is also includes publications from the literature review.

The theoretical foundation for this study is the implementation of a literature review and other sources of relevant literature. The theoretical foundation is collected based on the principles of user research and study. This allows the study to find theory that is relevant to study users, user behaviour, characteristics and user needs in Information Systems and then relate it to BI systems. The theory chapter discusses and explain the relevance of IA and HCI when arguing

for the complexity and relevance of users during the entire design process of a system that is targeted at users. How information is used and directed towards users requires knowledge about users for systems to be useful, successful and valuable both to the user but also to the organisation that earns the profit of the employees or users' efficient use of BI solutions. Therefore, it is argued that the D&M IS success model is insufficient in the study of users despite that BI systems and IS have similarities for success. The themes which are the focus of the questionnaire and interviews are based on principles of IA, HCI and concepts deemed important by scholars from the literature review and research within the field of user-centred studies and BI. This allows the study to focus on specific areas of user research such as development, implementation, feedback, training, trust and value.

The methodological foundation then allows the study to obtain data that can provide insight to these areas. The methodological approach of this study enables it to take areas of theory and apply these practically to the user in order to collect valid, trustworthy and useful user data on these areas of interest. It is important to make use of both quantitative and qualitative data gathering strategies in order to obtain as much data and as reliable data as possible. The methodological research paradigm of the study is one originating in the interpretivist/constructivist paradigm. This paradigm is widely recognised and characterised by the inclusion of both quantitative and qualitative data gathering methods. It is argued that by employing both methods, the study can use quantitative data to support or expand the understanding of the collected qualitative data (MacKenzie & Knipe, 2006, para. 9). Furthermore, by adopting the interpretivist/constructivist approach it is possible to understand, analyse and interpret how users experience working with BI solutions and which themes are important for them. The research methodology makes it possible to investigate users to achieve an understanding about what makes the work with BI solutions valuable to users and thereby concluding this study by suggesting which themes are important for the users and suggest that considering the users and these themes in the implementation, adoption and use of BI in organisations would make the BI solution more successful, beneficial and valuable to the organisation as well.

The data analysis strategy for this study is what enables the study to combine the theory, methodology and data in order for it to analyse and interpret data to obtain possible conclusions and findings within the data and compare these to existing literature. Principles and areas of the outlined analysis strategy will be employed to make full use of the collected data. The

data analysis strategy also originates from the interpretivist/constructivist paradigm which allows the researchers to compare interpretations from questionnaire and interviews with their own knowledge from theory. As intended, the topic of this thesis which is outlined in the introduction and literature review cannot be investigated properly or thoroughly without applying the research methodology that determines the mindset for investigating the issues and the theory outlines the concepts of why the study is being executed and the theoretical foundation for understanding the issue and the methodology decides how, in practice, it is possible to answer the research questions with relevant methods.

Chapter five: Empirical Data

This chapter aims to outline the different categories that will be the focus of the analysis. These categories determine the themes that data will be coded from in the forthcoming analysis chapter. This fifth chapter, furthermore, aims to present a short overview of the findings made within these categories as collected in both the interviews and the questionnaire. It should be noted that the chapter does not aim to analyse, interpret or compare data to theory or other data, it is merely a representation of the found results according to the key categories of the study. Analysing and interpreting will be done in the forthcoming analysis chapter (chapter six). This chapter will go through the main categories and the additional categories of the data collection by using the relevant categories outlined later during this chapter.

This chapter also revive information about respondents and participants for the interviews and the questionnaire and explain general information about the interviews and questionnaire in order to structure and guide the analysis. The data collection can be separated into a table to easily comprehend which components that constitute the data collection:

Data collection method	**Referred to in text**
User interviews (appendix 11-14)	Participants (User 1, 2, 3, and 4)
BI Interview (appendix 10)	Distributor
Questionnaire (appendix 15-17)	Respondents

The left column describes which kind of data it is and how it will be referred to throughout this chapter and the following chapters. The right column describes how the participants of the data collection are referred to also throughout this chapter and the following analysis and discussion. This division is created because it is necessary to distinguish between them. User interviews are the SSI's conducted with participants from an organisation where these participants work with BI solutions regarding their daily work tasks. These participants are chosen, as further described in the methodology chapter, because of the convenience of these participants for the data collectors. The participants have voluntarily and anonymously participated in the interviews and contribute with their experience on working with BI solutions for daily work tasks, which will be examined, analysed, discussed and interpreted in the following chapters to see which patterns can be related

between users and efficient BI solutions. The participants of the user interviews will also be referred to as user 1 (appendix 11), 2 (appendix 12), 3 (appendix 13), and 4 (appendix 14).

The BI interview is conducted with one participant, called the distributor. The distributor is an actual distributor of BI solutions to other organisations. It has been identified in the literature review and in the introduction of this thesis, that BI solutions are a highly acknowledged tool and that it holds many advantages for optimising business procedures, however these advantages can be difficult for organisations to achieve and the role of the user in the failure or success of this achievement is unclear. This interview outlines, from the perspective and experience of a distributor in practice, how the distributor sees the potential of working with BI in organisations and how the distributor believes that users should or should not be involved during the process of developing, implementing and using BI. This interview will be referred to and compared to the user interviews when it becomes relevant during the analysis and discussion.

The questionnaire and the 22 respondents of this questionnaire will be referred to as the respondents. The questionnaire seeks to illuminate the same themes that are the focus of the user interviews. The questionnaire and user interviews will be compared but also analysed from the main categories of the analysis strategy as will be elaborated later in this chapter. The questionnaire is a more fixed and specified method to study experiences and understandings, which provides more limited answers compared to the in-depth answers of the user interviews. The questionnaire investigates if a pattern exists between users having been involved in processes related to BI development, implementation and use and users that are positive and value the BI solutions for solving work tasks. The findings of the questionnaire are relevant and interesting to compare to the user interviews and see how these two methods might either present different or similar user experiences and understandings of BI solutions in organisations.

5.1 Categories

As mentioned within the data analysis strategy, the coding of data will take outset in a deductive strategy that enables the study to find key areas that can help inform the analysis, discussion and findings of the study and will furthermore assist in examining the overall concept of the study, the user and their role in beneficial BI solutions. The core categories that is embedded within the theory chapter of this study is outlined in the figure below:

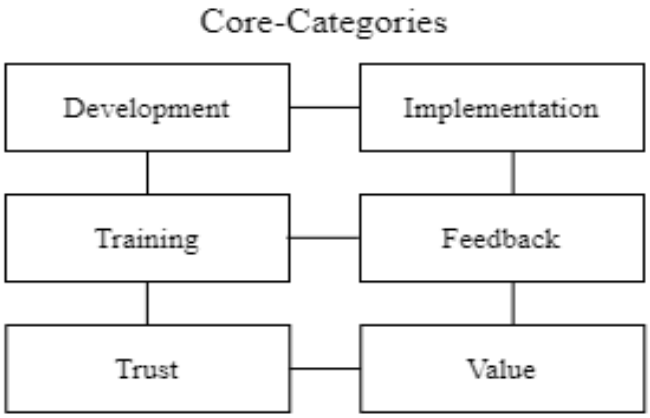


Figure 4: Core categories

These categories were found to be of importance when dealing with the idea of user research within the field of BI. These categories take outset in the theory chapter of this study which is based on identifications from the literature review, the additional literature found relevant for this study and scholars within information science and users such as Rosenfeld et al. (2015), Preece et al. (2015) and Kim (2015). The theoretical foundation makes it possible to deductively investigate the data collected in the form of user interviews, BI interview with a distributor, and a questionnaire with a specific purpose; it is argued that these categories and how users experience and value these categories can contribute to understand what provides the best foundation for the successful and valuable implementation and continuous use of BI solutions in organisations. Lastly, the categories have been scrutinized within the data for the study to investigate if these categories serve as valid areas of interest in a practical and not just theoretical setting.

In order to elaborate on the inductive method that this study also applies from the interpretivist/constructivist approach (MacKenzie & Knipe, 2006), the categories above are assigned another category named Additional Categories. The additional categories are relevant because it allows the analysis of data the identify issues or themes that are relevant and interesting for this study and to investigate these themes that can contribute to answering the research questions. Executing the deductive strategy happens during the analysis of the core categories and the inductive strategy executed by adding the additional categories. The additional categories were discovered during the analysis and examination of the data. The additional categories are presented and included in this final figure but will, however, not be further discussed in this chapter. The

conclusive layout of the strategy for analysing the collected data will therefore be from the following categories:

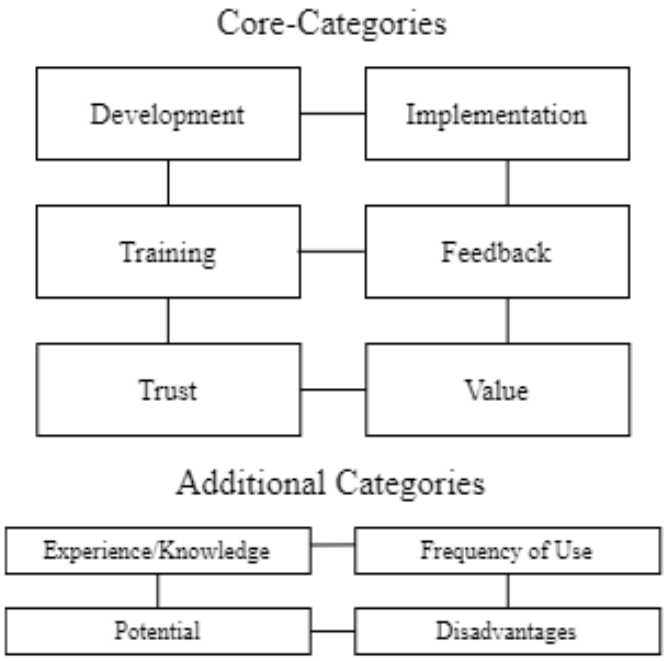


Figure 5: Core categories and additional categories

5.2 Findings in user interviews and questionnaire

The following section will collectively summarize the findings of core categories from both user interviews and the questionnaire. Lastly, the core category findings from the BI interview with the distributor will be identified. The additional categories will not be identified or elaborated in this chapter, but in the beginning of the analysis chapter.

5.2.1 Development

Within the sphere of development, the study was not investigating how easy or not easy BI is to develop or what it is like to develop BI solutions. The study aims to uncover whether respondents have been a part of the development process in terms of specification of requirements and secondly whether respondents would see exactly this as being beneficial, both on an individual level but also on an organisational level. It is found that 42% of respondents had nothing to do with the development process and have merely been set to use an existing BI solution (Appendix 16, Q. 15). Of course, these results can to some extend be flawed based on respondents' time of

employment or time of development. The user interviews demonstrate that participants feel that being a part of the development process is beneficial for the company as developers typically deal with specialised areas and in that way can ensure improved results for the BI solution (Appendix 10, l. 40-45).

5.2.2 Implementation

As well as the development aspect, the purpose is not to investigate who created the implementation strategy, the purpose is to investigate if users have been involved during the implementation process and if users would regard it as beneficial to create an implementation process the includes users in the realm of BI. Within the questionnaire, it is uncovered that roughly 32% of users have not been part of the implementation process to any extend (Appendix 16, Q7). However, it must be included that the answer can be dependent on the length of employment and implementation. Within the Interview data it is possible to make the conclusion that there should be an increased focus on user involvement during implementation in order to best succeed with the implementation of BI, which in turn leads to the use and value of BI (Appendix 14, l. 88-97).

5.2.3 Training

Training would, in an ideal setting, be part of an implementation process. It would be the part where users would be taught about the different data presented in a solution and be educated in using the tool. The study aims to find whether a relation exist between users who had some form of training in terms of the use of BI solutions and whether users see this as a valuable asset in making the solution beneficial to them and the organisation. Within the data collected it can be seen in Appendix 16, Question 10 that 45% of users have not received any training or education in regards to the BI solution. This is emphasised in the interviews where a respondent argues that missing training could potentially be a problem as the solution could leave some users behind or be misunderstood (appendix 12, l. 102-116). The interview data enables the study to make the conclusion that training, and education can serve as a vital part of creating value to a BI solution as it enables the user to optimise their use of the BI solution. An example of this can be seen in Appendix 10 line 69-72, where it is explained that a course day or some other form of training would be necessary for the individual users to properly understand the solution.

5.2.4 Feedback

The feedback category has been chosen as to investigate whether it has been possible for users to provide feedback on an existing BI solution, with regards to further development or optimisation, and whether a call and response model like this would be beneficial to the user and organisation. The questionnaire data found that more than 50 percent of users have not felt that feedback has been an option to a large or to some extent, maybe to a small extent with minimum changes but not a fulfilling extent (Appendix 15, q. 9). The interviews show that being able to evaluate and give feedback to existing solutions is something that can create value for the individual user but also for larger departments and the organisation as a whole, as it enables data to be refreshed and used in different ways according to the task at hand (Appendix 13, l. 184-197).

5.2.5 Trust

The idea of the category of trust is to understand how important it is to the user that there is trust in the data visualised in a BI solution as well as trust to the people that design and develop the solution. Within both interview and questionnaire data it is uncovered that the trust in BI is high and that this is simultaneously of great importance. In Appendix 15 Question 27 the majority of respondents have great trust in the data visualised in BI and trust in BI in general. The interviews reveal that trust in both data and development is of vital importance for a BI solution to succeed (Appendix 14, l. 105-111),

5.2.6 Value

Value is to be understood as to how many respondents think that BI is to some extent a valuable asset for them and the organisation in relation to solve work tasks. It is argued that the combination of the above-mentioned core categories all contributes to the notion of value. The questionnaire reveals that most respondents find value in their respective BI solutions, 86% to be precise, of respondents find that BI acts as a valuable asset for their work and for them individually (Appendix 16, Q. 30). This emotion is further supported in the interviews, this is an observation that can be made in most of the user interviews. An example can be found in appendix 10, line 106-113; in this example, the value aspect is related to time and time saving.

5.3 Findings in BI interview with distributor

This interview is different from the user interviews as it is not made from the point of a user, but from the point of a distributor of BI solutions. This data will have recurrence in the analysis section as it might be able to uncover certain dispersions or cohesions from the perspective and expectations of respectively a user and a distributor. The reason for the distinction in the interview and the data collected is to examine whether there would be a different set of emotions at play depending on whether the respondent was a user of BI or a distributor of BI solutions.

5.3.1 Development

The notion that a development process is important is shared as well by the distributor of BI solutions however, the distributor emphasises that there is no need for technical knowledge for the individual user and focus more on a development process itself when asked. In appendix 10, lines 113-129, it is argued that it is important for BI to be understood as a visualisation tool with emphasis on what the specific numbers are important to each employee using it, and emphasise in this that there is no need for technical knowledge. However, within these lines it can also be seen that the respondent agrees with the fact that there should be a focus on understanding the numbers and making sure the numbers are relevant to the employee and the task at hand.

5.3.2 Implementation

The emotion towards implementation and an implementation process is similar to the user interviews. It is stressed during this interview, as in the user interviews, that it is important to have focus on an implementation process to make the organisation change as smooth as possible, but also in order to make employees understand why it is necessary to incorporate this new solution in their workplace. In Appendix 10 lines 133-136, it is explained how an implementation process is of great importance for any company seeking to implement a BI solution in their organisation.

5.3.3 Training

Training and education of users from the perspective of a distributor of BI solutions, is argued to be important. The distributor emphasise that training is critical to achieve a successful implementation and that an introductory course would be highly relevant (appendix 10, l. 141). The distributer furthermore argues, that both the distributor and the organisation itself must implement and train users to avoid users lose interest and understanding and may become reluctant

to use BI (appendix 10, l. 141-152). It is explained that making sure that employees have a good understanding of both the functionality of the solution and a good understanding of what the different numbers represent is of importance if the solution is to be used in the first place but also to its optimum.

5.3.4 Feedback

In line with training and implementation, the aspect of maintenance is also discussed and explained. In this case both in the form of technical maintenance, which of course is an important factor for the seller and the company delivering the solution to make sure that all data connection etc. are up to date. However, with regards to this study the idea of maintenance in a user context is to be understood in the form of user feedback on functionality, visualisations, information, design etc. In Appendix 10, l. 155-161 it is argued that it is imperative to the value of the BI solution that users are constantly with the opportunity to provide feedback both in terms of relevant data and functionality.

5.3.5 Trust

Within the interview the idea of trust is somewhat brought into this as well. In Appendix 10 lines 164-174, it is explained that in order to secure trustworthiness and general trust in both data and delivery it is important that an organisation have ambassadors that will take charge in understanding more technical aspects of the solution whilst simultaneously being in contact with the company delivering the solution. It is furthermore, argued, that trust in the context of BI is one of the most important factors as the entire validity of the solution rests on the fact that users are able to trust that data represented in the solution is correct.

5.3.6 Value

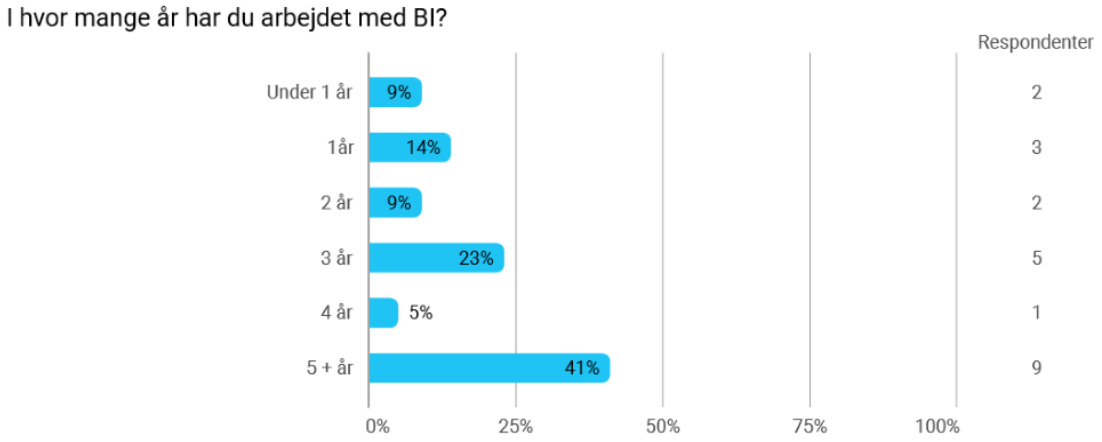
On the idea of value, what value is and what creates value in a BI Solution, it is argued from a distributors perspective, that value is created in getting rid of unnecessary data and being able to focus on the important numbers for the organisation for the BI tool to be a foundation for business future and strategy. It is argued, that BI can bring value to organisations because it enables organisations to be more specific in their analysis of data and that it enables monitoring possibilities, reporting and overview. It is further argued that BI in contrast with other data analysis and representation methods are beneficial in that it holds the capabilities to take large data sets and

form them into something concise, precise and relevant in a short manner, instead of there being myriads of data to go through (appendix 10, l. 178-190).

Chapter six: Analysis

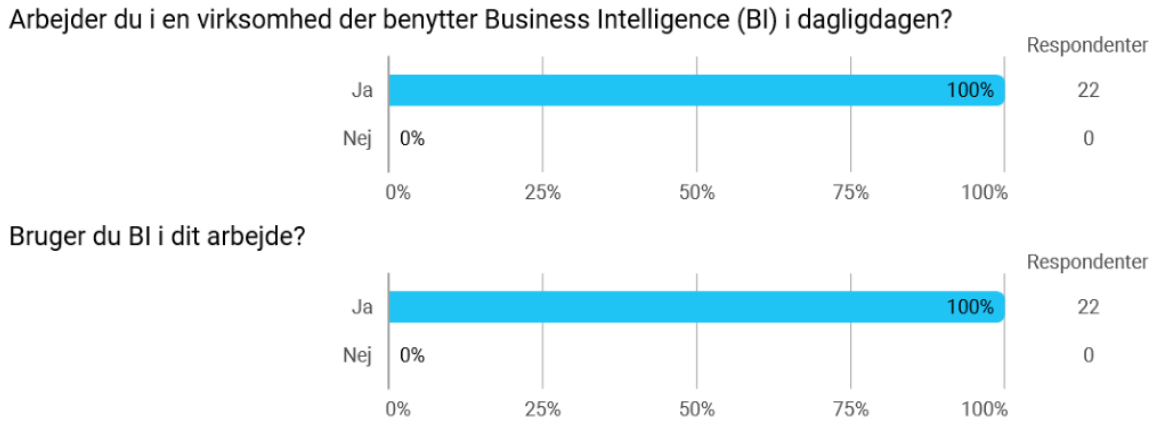
The participants of the user interviews are employees in an organisation that applies BI solutions daily or are during an implementation process of a BI solution. These participants are the end-users of such BI solutions, a user that actively engages with the interface and information of a visual BI solution to support or solve work tasks. There are four user interviews and they will collectively be referred to as participants or separately as user 1 (appendix 11), user 2 (appendix 12), user 3 (appendix 13), and user 4 (appendix 14). The four participants work in three different organisations. One company employs about 35 people, the other company employs approximately 100 people and the last company is a large organisation with several departments across the country and more than a thousand employees. One of the organisations has an internal developed BI solution, another has a BI solution developed by a distributor and the third organisation employ both externally and internally developed BI solutions. The organisations that the participants represent are not a chosen for a specific reason however, the participants were chosen because the participants and the students behind this thesis were familiar with each other and because the students knew that the participants would be appropriate for this investigation because of their position in the organisation regarding their use of BI solutions in daily work tasks without being related to the technical aspect of developing or maintaining the BI solution, but only as an end-user function. The user interviews will be analysed in this chapter according to core categories outlined in the previous empirical data chapter. Furthermore, the user interviews will also be analysed for further categories, the additional categories, to ensure that valuable information for this thesis will not go lost by only including the core categories.

The questionnaire is completed by 22 respondents. The percentages and total numbers are therefore calculated from the fact that the total amount of respondents is 22. The answer rates, percentages and number of answers are all collected from appendix 15 and 16. 41 percent (nine) of the respondents in the questionnaire has worked with BI for five years or more as can be seen in the bar chart below.



(Appendix 15, q. 3)

Only 9 percent (2) of the respondents worked with BI for less than a year. More than half of the respondents have three years or more experience with BI which establishes that the respondents are familiar with BI and would feel comfortable answering the rest of the questionnaire. This also agrees with the observation that more than half of the respondents have reported medium, good or very good knowledge about BI (appendix 15, q. 4) which contribute to ensure a certain quality of the answers provided in the questionnaire that will be analysed during the next many sections in relation to the core and additional categories. The respondents have known BI and worked with the solution for several years and should therefore be very familiar with the tool and know about its possible potentials, limitations and values regarding work tasks, business procedures and decision-making. Respondents have also answered that their organisation uses BI daily and that they use BI in daily work tasks.



(appendix 15, q. 1-2)

These two questions function as validation for achieving appropriate respondents to the questionnaire as also explained and elaborated in the previous chapter about methodology. The first couple of questions in the questionnaire ensure relevant respondents to elaborate on how users' value certain themes about user involvement in the use of BI solutions in organisations. The respondents have experience and knowledge about the tool and use it on a concurrent basis, which supports the following analysis in dealing with appropriate and relevant respondents, creating a solid foundation for thorough analysis, discussion and findings.

The BI interview with the distributer will be used when relevant during the analysis to either support an observation or contradict it. The interview with the distributor will be used to see differences and similarities in the expectations and values regarding user involvement between the user and the distributor regarding core and additional categories.

To shortly refresh how data collection methods and the people involved in the data collection will be referred to throughout the analysis the table is presented again below. The table demonstrates that if 'participants' or 'user 3' are analysed it refers to data from the user interviews, and if 'respondents' are analysed it refers to data from the questionnaire and so forth.

Data collection method	**Referred to in text**
User interviews (appendix 11-14)	Participants (User 1, 2, 3, and 4)
BI Interview (appendix 10)	Distributor
Questionnaire (appendix 15-16)	Respondents

The analysis will be structured by using figure 5 below about core and additional categories and will be analysing both user interviews, questionnaire and the BI interview when it is relevant.

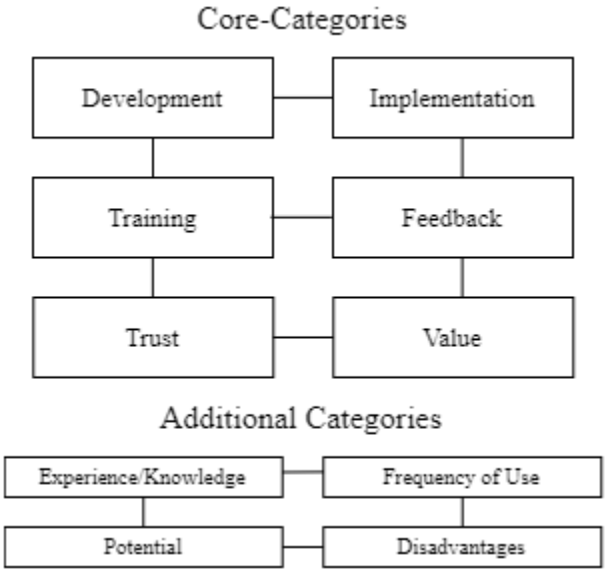
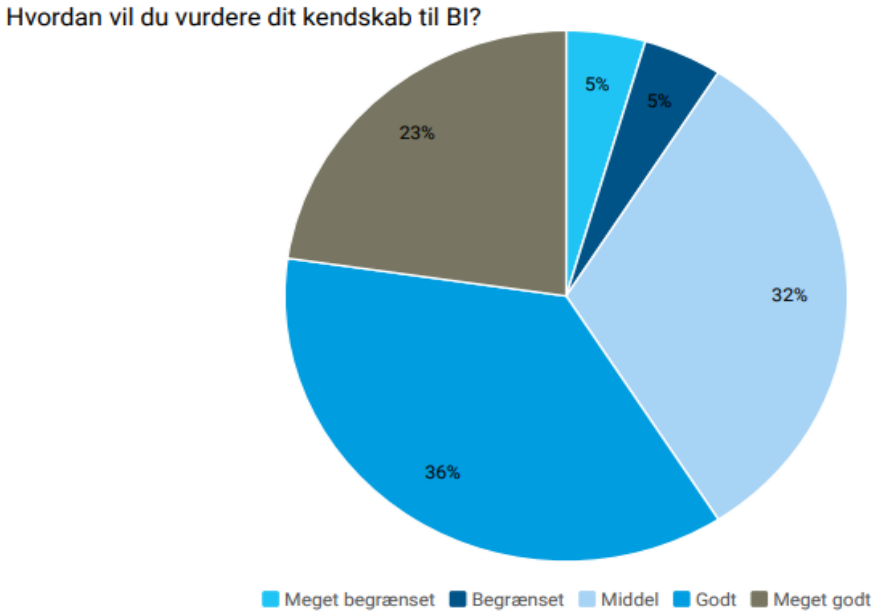


Figure 5: Core categories and additional categories

6.1 Additional categories

This section aims to clarify which additional inductive categories that were found during the investigation of the collected data. This section will largely refer to empirical findings however, these categories were found after the investigation of the collected data, hence why they are presented here instead. These categories have been included as additional categories as they have been found not to be extensive enough for them to be points of analysis on their own based on the chosen theory. On the other hand, it was discovered that the additional categories were important to include and this following section will elaborate on why. These are categories that will be used in the analysis to inform the analysis of the core categories within the analysis chapter of the study. They will further be used to see if these could be argued to be important to the results of results within the core categories, in other words, they will be used in comparison with core categories. These categories follow the coding schedule explained in the methodology chapter.

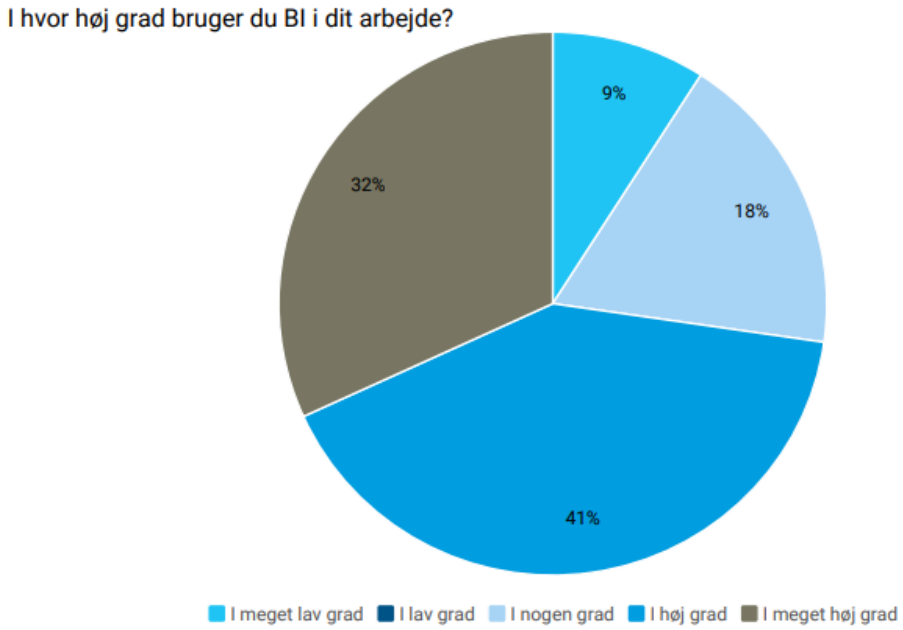
The first additional category that was investigated in the data collection was how much experience and how well respondents would rate their knowledge of BI as a tool. It was found that the majority of the respondents has substantial knowledge and experience with BI. Within Appendix 16 Question 3 and 4, it is documented that a vast majority of respondents have more than 3 years of experience with BI and that a large majority would rate their knowledge of BI as medium or more.



(Appendix 16, Q. 4)

This pattern of knowledge and experience can help support the data further analysed and interpreted within the analysis section, as it reveals that a vast majority of respondents are competent with the BI tool and that this is not a source of error.

The next additional category found interesting to examine is how often the respondent make use of BI, whether it is a tool that is used on a daily basis or if it something that is merely used as a monitoring tool occasionally. In Appendix 16 Question 6, it is unravelled that although a majority of the respondent use it for less than half of their work tasks within a month, there is still a percentage of 46 that use it for half or more of their work tasks. It should be noted that the BI tool could still be used daily by those who use it for half of their work tasks. This idea can be seen in Appendix 16 in Question 31.

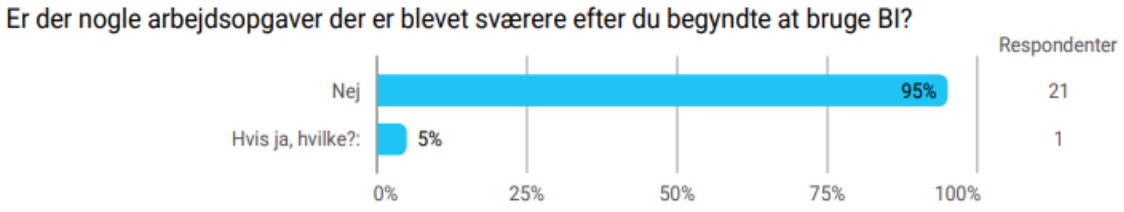


(Appendix 16, Q. 31)

This shows that although it is not used for most work tasks it is still used to a large extent within the work of the respondents. The important result to note here is that few of the respondents answered that they only use BI to a very small extent in their work environment.

The third additional category found of importance to include as a possible factor in the analysis is the idea of the potential of BI, moreover what is seen as the potential from the distributor. Within the interview with the distributor in lines 178-190 (Appendix 10) it is clarified that the potential of BI is the idea of time-saving. It is the idea that BI can solve the issue of old fashioned and time-consuming data management and interpretation. It is, moreover, discussed that the potential of BI lies within the fact that it is a quick and easy way to connect data to the overall strategy and purpose of a company. The idea that one of the main benefits of implementing a BI solution is one of time-saving is shared with the users. In Appendix 11 lines 108-109 User 1 argues "...så jeg får noget mere tid frigjort til at gøre de ting hvor jeg måske bedre kan gøre en forskel..." here it is argued that the potential benefit of implementing a BI solution is that more time can be used in areas that can make a vaster impact on the organisation. Furthermore, it is argued by user 2 in Appendix 12 lines 183-184 that an important potential of BI is the support it can bring to decision-making process "Jamen jeg mener det kan give et indblik i hvordan virksomheden skal agere og hvilken strategi man skal lægge for dagen".

The last additional category that was identified within the data investigation is the investigation and analysis of possible disadvantages of implementing a BI solution. This section takes a point of departure in the distributor interview to later be analysed whether the disadvantages are in cohesion with users' expectations and experiences about disadvantages. The distributor interview in lines 50-51 (appendix 10) it is identified, that if a BI solution is not carefully devised it can become a disadvantage for the company or the user "…jamen det er der, det er der helt sikkert hvis både man måler på for meget og man, man ikke måler på de rigtige ting…" (appendix 10, l. 50-51). It is discussed that a potential disadvantage of a BI solution is found within use of measurement. It is argued that a BI solution lose value if it does not measure the correct data or if the organisation chooses to measure on too many or the wrong aspects. In appendix 10, l. 64-66 it is further argued that this is not only an aspect that can become a disadvantage for the user and the company, but that it is an aspect where the distributor have a responsibility to advice their customers and users. The interview with user 1 share this idea as well in l. 116-120 (appendix 11) and also argue for the volume of data. It is, furthermore, argued that the data presented is "only" numbers and that when analysing and using these data it is important that the company and user also analyses the humane reason for why the results might be different than expected, otherwise the data can become skewed and become a disadvantage for the company instead of benefiting it. Within the data from the respondents of the questionnaire, in a more practical setting, it is revealed that only 1 of 22 respondents have found that some work tasks have become difficult after the implementation of a BI solution.



(Appendix 15, Q18)

In other words, it is revealed that BI to a very large extent is a benefit to respondents and the organisation.

6.2 Development

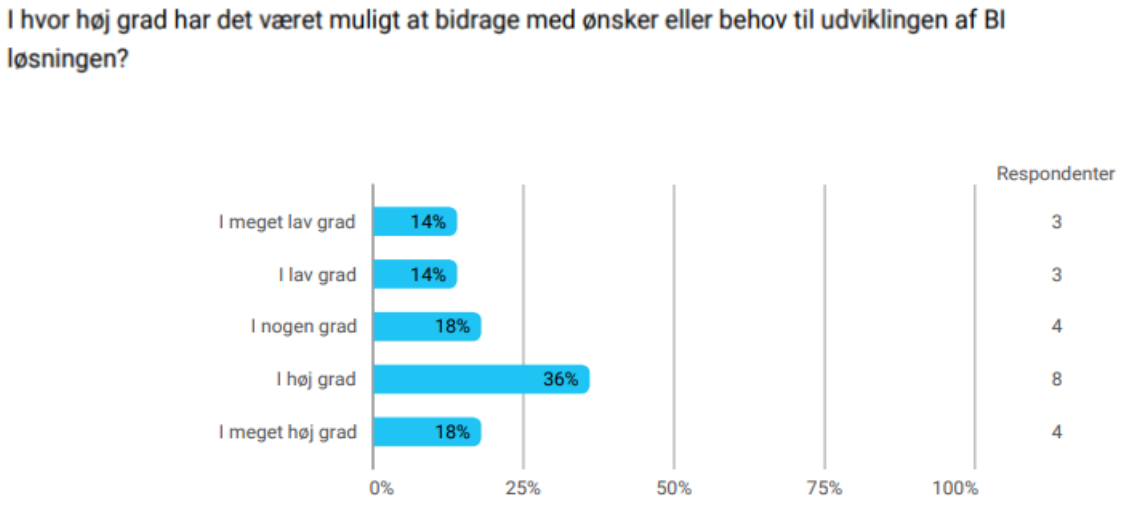
This section of the analysis seeks to investigate what patterns can be found regarding user involvement within the development process of BI solutions, and which ideas and emotions can be identified in making this process beneficial. It further investigates how theory and patterns in theory on user involvement relates to the collected data, and how these overall relate to the first observation that user research is to an extent lacking. A relevant fact to why users must be considered even before any analysis is the idea described by Adamala and Cidrin (2011) that non-technical problems serve as a major factor in the failure of many BI projects (p. 125).

Within the literature review of this study is was found that user research and involvement in literature concerning BI solutions and the development of these was lacking. This idea aligns with the initial observation regarding the practice of this, that users were possibly not involved during the development process of BI solutions. However, theory that exist outside the realms of BI, is concerned with user research and involvement in software, application, and website development. It is therefore applied in this analysis and Rosenfeld et al. (2015) argue that the user is the ultimate judge and that it will only be beneficial for the user to work as allies during the development process of an information solution (p. 333). This is further argued by Adamala and Cidrin (2011) that development must always happen with the end user in mind, as users are the real and active users of the solution (p. 125), specifically with BI in mind. When analysing and comparing the theory on users' role in development, the pattern that emerges is one of involvement. When a user is theoretically described it is argued that they are of great importance to the overall project. Furthermore, development is often related to shift and change, and the theoretical pattern describes how it could possibly be beneficial for all involved if a shift in development was changed from a more technical outset to be one of more user and human focus.

The interviews do not necessarily display whether the participants have been a part of the development process. However, it is uncovered that all participants agreed with the point that being a part of the development process would be of beneficial significance for the entire project and assist the user in achieving value with the BI solution. An example of this pattern can be seen in Appendix 11, Lines 40-44 "Ja … netop fordi vi er så specialiserede så kræver det at man har en forståelse…". Within this section the concept of understanding and awareness is discussed, and it is acknowledged that the real benefit of user involvement in a development process is the idea that the understanding of the solution is increased by involving the user. As

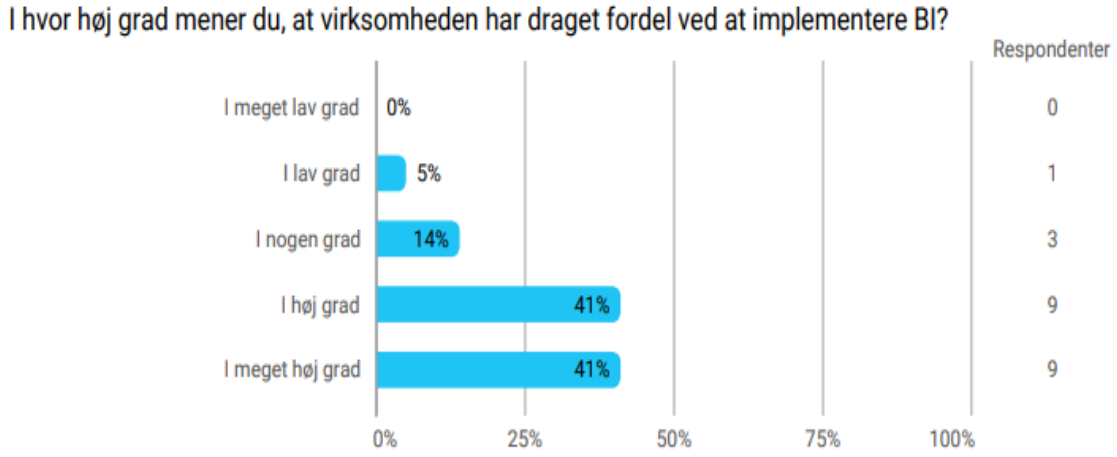
mentioned, this is a notion that serves as a silver lining throughout all user interviews. What can further be revealed from the findings in the data that relates itself to theoretical measures (Adamala & Cidrin, 2011, p. 125) is the pattern of specialised areas of work and the idea of involving the user in the development not just for the user but also for the developer in order to create valuable solutions. The distributor interview also have a focus on the user and the user understanding but what is also covered in this, is that there seems to be an importance in the separation of user based development and technical development (Appendix 10, l. 113-129). The distributor argues that there is not value or advantage in users learning to develop actual BI solutions, this is again a pattern that is supported in the theoretical foundation of Adamala and Cidrin (2011). Further what is interesting about this pattern of separation in the understanding of development seems to be almost implied within the user interviews. It is argued by user 2 that although it is important for users to be a part of the development process it is important that there are only few that maintain the larger overview of the actual development (appendix 12 l. 94-101).

The questionnaire further enables the study to see a possible pattern that follows the idea and correlation between user involvement in development and the overall value of the BI solution. In appendix 15 (q. 15, 33) it is found that a majority of the respondents within this particular survey have actually been a part of the development process, or at least feel they have had some opportunity to provide input to the solution during the development process.



(Appendix 15, q. 15)

In comparison with other variables and questions in the questionnaire it can reveal a pattern of value. In appendix 15 (q. 17, 18, 19, 30) a vast majority of the respondents find value both on an individual level but also on an organisational level with regards to the specific BI solution in their organisation.



(Appendix 15, q. 18)

The pattern revealed is that user involvement in the development process leads to better value in the result for the end user. It should be noted that there of course is some dispersion within these results, meaning that there are also respondents who were not a part of the development process and find value in the BI solution. However, as mentioned it is the majority that were a part of the development process and the vast majority that finds value in the BI solution. We can further see this by employing average calculation and see that the average answer is equivalent to 4.4 with answers 3-5 being that the user has been involved in the development process.

From this analysis of development of the qualitative and quantitative data it is possible to deduce that patterns within observation, theory and collected data tend to agree on points of user involvement, specification, separation of development, and user research. Within the development phase of a BI solution it can be interpreted from the data that users, as well as existing theory, find it to be beneficial and of importance that user should be a part of the development process in order to create value within the BI solution. Although the original first practical observation, that the lack of user involvement in BI development, should to some extent be re-evaluated as it seems that most users within the survey have in fact been a part of the development process. However, it should be noted that there is still about 30 percent of users that

were not a part of this process (Appendix 15, q. 15, 33). However, it does seem that the patterns revealed in this analysis and interpretation of data and theory would suggest that the academic lack of the user's role in BI in general and within the development process specifically is an issue. However the pattern of separation of the term “Development” would have to play a part in this as well, as users might not find it beneficial to be obliged to obtain knowledge on the technical aspect of development, but more with regards to them being a part of the larger or a more specified part of the development process.

6.3 Implementation

Taking a point of departure in the user interviews this section aims to analyse how users explain their own and other users' relevance and the optimal user involvement when it comes to the implementation of a BI solution in an organisation. The section will also afterwards analyse the identifications from the questionnaire about user's opinion and experience from the implementation of a BI solution. As a part of expecting to have a very useful and beneficial tool for the organisation and achieve very true numbers about the organisation and thereby discard all previous spreadsheets, user 1 has high expectations about the implementation of a BI solution in the company (appendix 11, l. 9-23). A part of these expectations seems to agree with the fact that user 1 explain that the implementation process of the BI solution has included a lot of contact and dialogue between the BI distributor and user 1 (appendix 11, l. 47-61). In this part of the interview user 1 specifically mentions that the dialogue about the implementation of the solution has provided new ways of thinking about BI and the information that can be provided by it. Furthermore, user 1 argues, that it is important to prepare all eight people that will actively use the BI solution for work tasks to make them a part of the implementation for users to use the right information and use it efficiently (appendix 11, l. 60-66). The contact and dialogue between user 1 who is integrating a BI solution in the organisation in collaboration with a BI distributor, is argued to be active and solid. User 1 also expresses value and potential of BI during the interview but at the same time emphasise that the usefulness of BI will first occur when user 1 and fellow colleagues has learned to manage and understand the tool (appendix 11, l. 136-142). This implies that it is important that the user is involved during the implementation process, to prepare employees or users properly and to create better information solutions (Rosenfeld, et al., 2015, pp. 333-334). User 1 also seems very positive about the whole implementation of the BI solution,

probably because there is a good relation and contact between user 1 and the BI distributor. It is also an acknowledged strategy to include users in this process for users to become the designer or distributors "allied" during the implementation and to also ease users' attitude toward change (Grubljesic & Jaklic, 2015). User 1 values this inclusion during the implementation.

User 2 also emphasises on the communication between user 2 and user 2's colleagues and the distributer of the BI solution regarding implementation. In this scenario a specific colleague is responsible for the implementation and the process involved in implementation. User 2 argues that it is relevant for the output of the solution that it is a colleague within the organisation that implements and is the key person about the BI tool (appendix 12, l. 132-144). Previously, user 2 has experienced a BI solution that was not developed with this specific organisation and its users in mind and it turned out to be an expensive and useless solution for the organisation (appendix 12, l. 65-72), as has also been discovered in literature that costs of BI solutions, especially when they fail are extensive (Gaardboe & Svarre, 2018b, p. 1-2). User 2 continues and argue that it is both very important that there is a person related to the project that know the organisation well who is a part of the implementation, but also that it is important that there is a person related to the project that might have a professional, more objective impression and overview of the project and situation (appendix 12, l. 94-101). User 2 has had different experiences with BI solutions and one experience was better than the other because of the relevance of the BI solution for the users. This support the argument that some BI projects fail, and it might be related to the disregard for users and the organisation as also emphasized by Grubljesic and Jaklic (2015, p. 306). User 2 argues that it is relevant to involve both users and the professionals in the project and that it has a relevant impact on the implementation process and there should be a dialogue both internally and externally and between these.

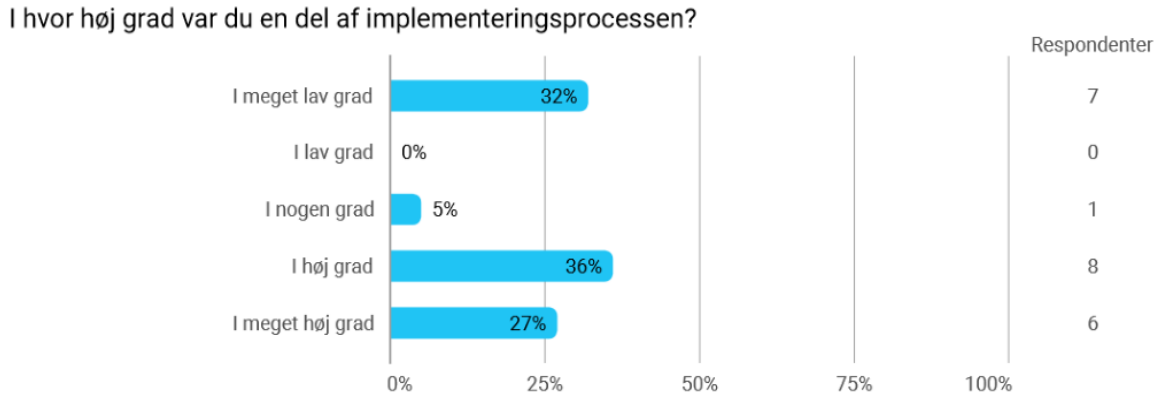
The BI tool is among the participants mentioned as used as a monitoring tool. User 3 from appendix 13 explain how in this organisation that probably half of the organisation's employees use information presented in a BI solution and that it is an ongoing team effort to use this information and decide which information the BI solution should display (appendix 13, l. 98-101). The use of BI is also highly supported by management in this organisation (appendix 13, l. 73-74) which is also argued in literature to be of high importance. However, according to Ain et al. (2019) management-level generally experience low levels of acceptance among their users of BI within the organisation (p. 8). This observation might demonstrate that management

commitment during implementation has a positive effect on users' acceptance towards BI. User 3 argues that it would be valuable and efficient for the use of the BI solution to include several parts when using the information transformed by BI such as the specific team, management, administration and the case of user 3 the web designer (appendix 13, l. 145-153). User 3 mentions, that several parts of the organisation has wishes, expectations and different wanted outcomes to and from the BI solution and it becomes important to include each of these parts as these expectations and outcomes would probably differ from individual to team level (appendix 13, l. 184-197). The implementation and the cooperation seem to be both important for user 3 but also something that at this point ensures a somewhat useful BI solution at the organisation already, which would seem why that was the reason that user 3 values cooperation and user involvement during the implementation process. This could also relate to the context of the IA model from Rosenfeld et al. (p. 32). It is important to consider the entire context of the organisation to create an appropriate and useful BI solution and the differences and similarities of the departments of the organisation and how these could benefit of information from each other. Furthermore, user 3 also emphasises on the inclusion of users on several levels in the organisation to be important for the value of the BI solution as implicated by theory. This might also be possible because the developers and designers of the Klipfolio BI solution mentioned by user 3 are all employed in the company (appendix 13, l. 231-232). User 4 also explains how the implementation of a solution developed within the organisation by other employees is "smooth" (appendix 14, l. 81). But despite it being a 'smooth' implementation of the BI solution, user 4 argues that "selvom det jo måske er nemt nok at læse nogle tal fra en skærm eller se på en graf (,) så er det jo stadig en omstilling der skal til (,) så jeg tror da nok at det at have information omkring denne omstilling er en rigtig god ide" (appendix 14, l. 88-90).

Most of the participants have different experiences with the BI solutions in their organisations, both solutions soon to be implemented and BI solutions that has been used for a longer period. Still, all mention how it is a social, collaborating process to implement a BI tool and that the user involvement is important to fully utilize the solution. The respondent soon to have a BI solution implemented expect the solution to save time to do other work tasks instead of updating spreadsheets (appendix 11, l. 106-113). Two participants emphasise that some users might be "left behind" (appendix 14, l. 94-95) or use the BI solution wrong or not at all without proper implementation involving the user (appendix 11, l. 62-66). The user expectations about the

solution are some of the gaps (Gaardboe & Svarre, 2018b, p. 6) to be discovered in this thesis, because the interviews reveal that the expectations about the implementation are that users are involved and that it would result in efficient implementation and thereby use of the BI solution. This complies with the theoretical aspect that argues that included users are more open to organisational change and a change in work tasks and to ensure user acceptance (Grubljesic & Jaklic, 2015, p. 304). The relevance of non-technological factors within the failure of BI projects could also be related to the lack of involving users during the implementation as mentioned by a respondent (appendix 12, l. 65-72). This is also relevant because there is a general pattern in the interviews that participants argue that the involvement of users during the implementation is important for the output of the solution.

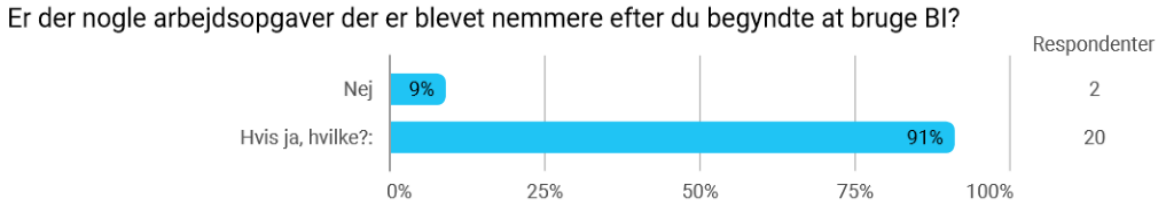
The questionnaire also focusses on implementation and how users were involved in it. Out of the 22 respondents 16 report that the BI solution has been implemented in the organisation for three years or more as mentioned during the introduction to this analysis chapter. 15 respondents indicate that they have been working with BI for three years and more. However, 32 percent (seven) of the respondents' report that they were involved to a very low degree during the implementation process.



(Appendix 15, q. 8)

Another 36 percent (eight) were highly involved during the process and another 27 percent (six) were to a high extent involved during the process. More than half were involved in the process which can be related the other positive answers about BI such as that according to 91 percent (20) some work tasks have become easier since the implementation of BI (appendix 15, Q. 17) and

that data visualised by BI is easy to understand is agreed upon by almost all respondents (appendix 15, Q. 20).



(Appendix 15, q. 17)

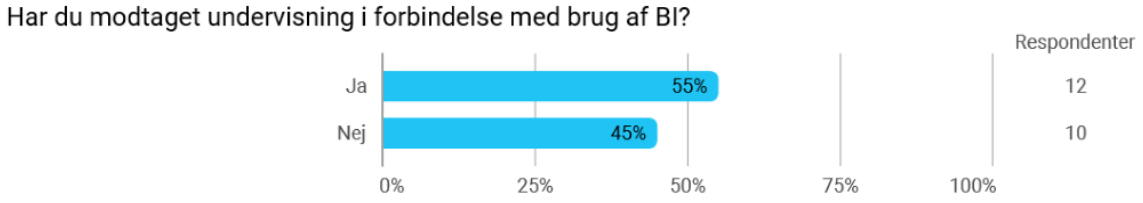
These observations correspond with the theoretical argument that efficient BI solutions exists when the user has been involved and included during the implementation. The distributor of BI solutions even deem that the right training and implementation result in successful BI solutions in organisations (appendix 10, l. 141-152). On the other hand, it must be considered that 32 percent of the respondents were only to a very low extent involved during the implementation process but still have indicated that for example their works tasks has become easier since the respondents began to use the BI solution. However, it may also be possible that this is due to other factors such as training or feedback or experience with BI from elsewhere.

6.4 Training

As a part of some implementation processes training naturally occurs or training happens both before and after implementation as way of introducing a new product to, in this case, users. Negash and Gray (2008) argue that the number of people within organisations that use BI is heavily increasing, and it must today mean that training is highly relevant, also because the attitude toward BI acceptance are dependent on various factors such as prior experience, age and computer self-efficacy which also determinate that users are different and must be investigated and trained for the work task (Grubljesic & Jaklic, 2015, pp. 303-304). It means that some user types will have no issues adopting and beneficially using BI solutions for work tasks despite not being a part of the development or implementation processes or having received any training. Others might experience difficulties using and adopting BI despite having received training and being involved. As identified by Tamm et al. (2013) user types can be very different.

However, it is argued that training would be beneficial for the effectiveness of the BI solution to train and educate users. User 2 argues that some difficult processes regarding learning to use the BI tool might be reduced and solve many difficulties if users received training (appendix 12, l. 104-106). User 2 emphasises that during user 2's own beginning of employment in the company would have benefitted from having received training in the use of BI solutions, how to use BI actively to solve work tasks (appendix 12, l. 110-116). This demonstrates how training could have ensured at better use of BI from beginning the adoption and use of BI. As mentioned earlier, user 1 also emphasise that it is important to train all eight users of the BI solution in their organisation for all to know how to use the BI information correctly and effectively by for example, having a day focussed on preparing users (appendix 11, l. 69-72). User 4 explain how the users of their internally developed BI solution was not subject to training and some of the users that were not so technically skilled or motivated were left behind (appendix 14, l. 92-97). User 4 also emphasise an interesting aspect by arguing that most companies would probably not set aside time and resources to tasks such as training of employees to use a BI solution (appendix 14, l. 95-97). The distributor of BI from BI interview on the other hand argues that both the distributor and the organisation itself must train users to avoid users losing interest and understanding and become reluctant to use BI (appendix 10, l. 141-152). Therefore, it might be very important for the organisation to invest money and resources in the training of employees facilitated both by themselves and the possible external developers of the solution to make the most use of the BI solution. This could also motivate some of those who are not interested in working with BI to see potential in using it and become motivated (appendix 13, l. 89-96).

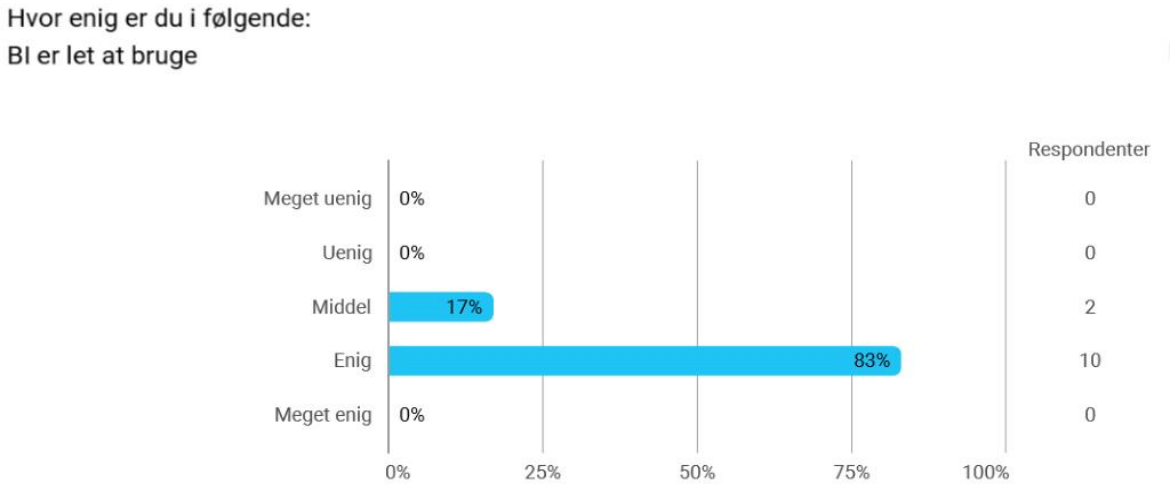
It is almost split fifty to fifty of how many received training regarding the use of BI.



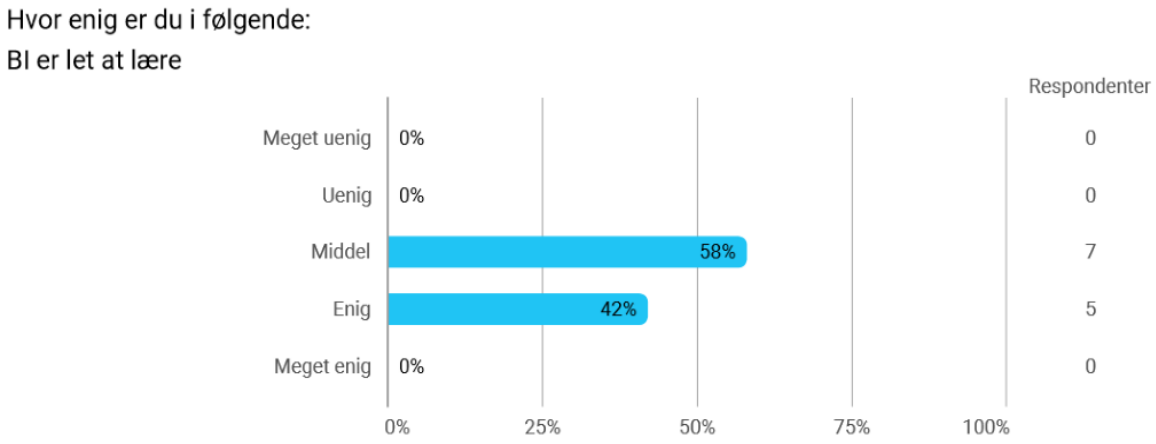
(Appendix 15, q. 10)

55 percent of respondents (twelve) report that they have been trained in using BI and 45 percent (ten) of respondents' report that they did not receive training. The ones that answered no to having received training are not asked the two following questions (appendix 15, q. 11-12) because it was

necessary to investigate how they perceive the following two questions without the questions being biased by the respondents who answered no. The interesting analysing part begins when respondents that answered yes are asked whether they agree with following statements; that BI is easy to use and that BI is easy to learn.



(Appendix 15, q. 11)



(Appendix 15, q. 12)

The respondents are mostly positive in their responses and 83 percent (ten) agree that BI is easy to use and 17 percent (2) agree to a medium extent. 42 percent (five) respondents agree that BI is easy to learn and 58 percent (seven) agree to a medium extent that it is easy to learn. This reveals that respondents who have received training has experienced BI as solution that is fairly easy to

learn and use in daily work tasks. This also corresponds with the participants from user interviews who also believe that both users and the organisation benefit from users receiving training in using the BI tool and will assist users in using the solution efficiently (Tamm et al., 2013, p. 3).

6.5 Feedback

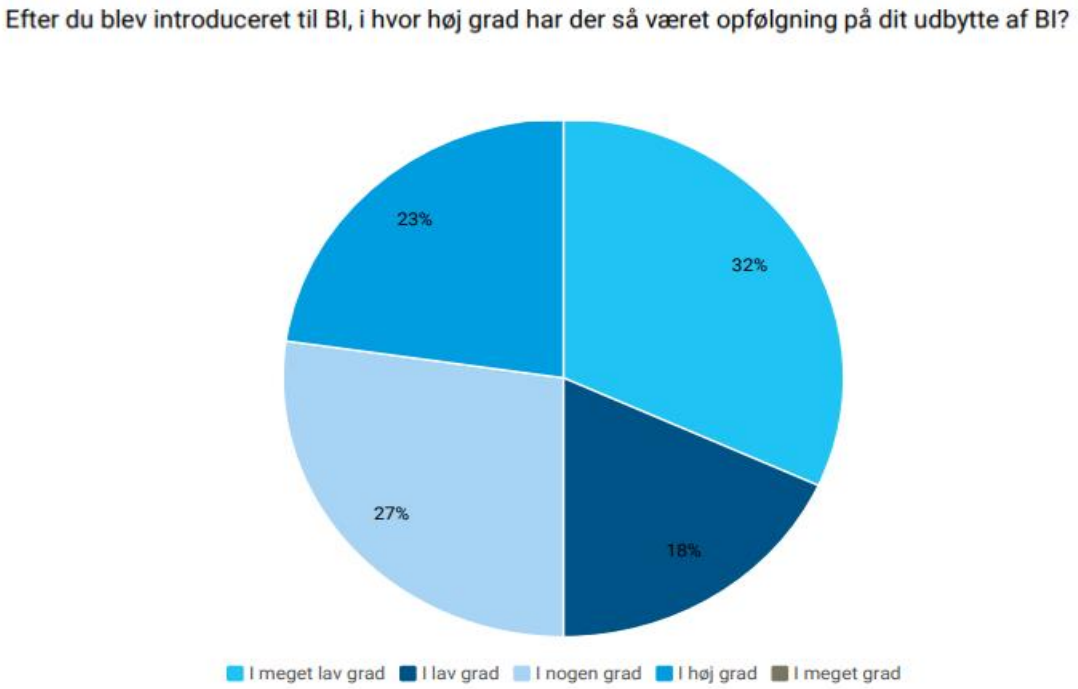
Within this section the concept of feedback or maintenance will be explored, analysed, and interpreted. This section takes outset in relevant theory regarding this topic as well as the data collected in both interviews and questionnaire to reveal patterns within this area. The section will be user-centred, understood in the way that the idea of maintenance from a developer standpoint will not be explored. As has been mentioned in both theory and earlier within the analysis, feedback is the idea of a user being able to comment on existing solutions after development and implementation is essentially over. It is a way for users to constantly review their solution to optimise its potential.

Within the original observations made as motivation for the study it was seen as an issue that there was not more focus on the user and user needs, a big part of this being the evaluation of existing solutions in order to facilitate the user. Within the literature review, it was further found that there was almost no focus on these aspects in literature regarding BI. However, within the theory and literature that had a focus on this, and theory existing outside the specific realm of BI a pattern can be observed. This is a pattern that supports the claim that a focus on evaluation and feedback is necessary to facilitate the best solution for the user. Smith et al. (2012) argues that the entire validity, efficiency, and relevance of a BI solution is completely depending on the use of ongoing evaluation and investigation of user needs (p. 591). Moreover, it is found by Molensky et al. (2010) that suppliers who received feedback did not apply it and did not base maintenance on evaluation and user feedback which made the solutions fail to meet user needs and requirements (p. 125). There is no question that the pattern in theory and literature that includes the user, is one that perceives feedback and evaluation as an important factor for user value and success in BI solutions.

Within the interviews it seems, that this pattern of the importance of feedback and evaluation is one that is agreed upon. User 3 argues that "… det er ret vigtigt sådan at evaluere på fordi det er svært at forholde sig til hvis ikke man får talt om det…" (Appendix 13, l. 184-185). User 3 discusses and presents that for the solution to have any value to the users it most always be

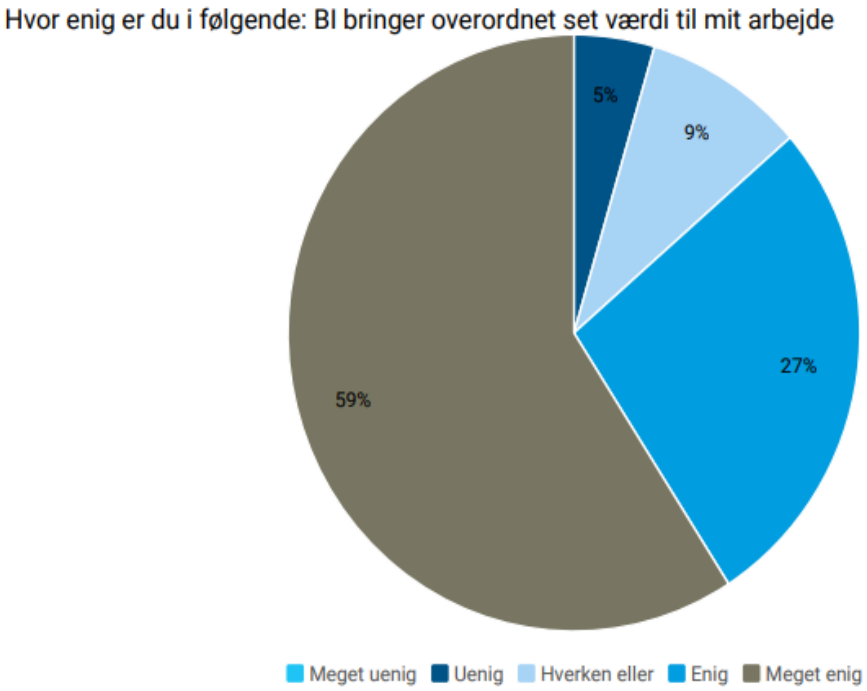
relevant, both in terms of data but also in terms of the task at hand. In the interview with user 1 this is further cemented "… så jeg tror på at feedbacken er den, det gør også at jeg føler at det er mit værktøj" (appendix 11, l. 77-78). It is further argued that feedback and evaluation is one of the core aspects that makes a solution feel personalised and not as a standard solution. The pattern within the user interviews is one that like theory suggest that feedback and evaluation is important for the value and success of a BI solution. It is moreover a pattern that suggest that feedback and evaluation can make a BI tool more personal within a given organisation and ensure that no standard solutions are delivered to a user or customer. This pattern is also shared by the distributor who argues that not only is feedback and evaluation important for the success of the solution, it is also a point of leverage for the distributor to make sure that the user or customer can always rely on them for support and maintenance (Appendix 10, l. 155-161). Although there is cohesion within these patterns of the importance of feedback, it is valid to interpret what is further mentioned in the interview with user 3; "… sådan en vurdering af hvad det er værd i tid … bliver ihvertfald sådan en snak om hvad er outcome i forhold til hvor meget vi lægger i det" (Appendix 13, l. 188-190). The quote discusses how it is important to remember that all efforts within this would either cost time and/or money and it becomes an issue of priority for the organisation. This pattern of theory versus practical reality will be explored more in depth within the discussion, however it is an interesting point made within the data.

Within the questionnaire, it seems that the pattern revealed is one that to an extent follows the pattern as seen in interviews, however within this data it can be questioned. The questionnaire reveals that a majority of respondents feel that there have been little to no possibility for feedback on their work with the BI tool.



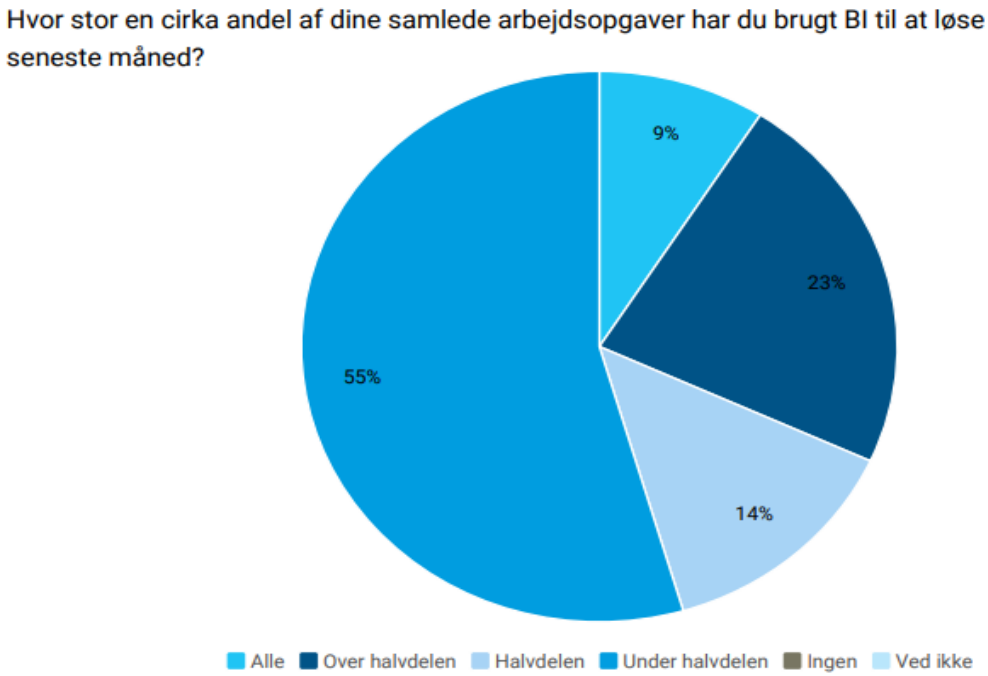
(Appendix 16, q. 13)

However, it is later revealed in the questionnaire that a vast majority of respondents feel that overall BI has brought value to their work.



(Appendix 16, q. 30)

This seems to reveal a pattern that shows that feedback is not of vital importance to the overall value of BI. However, it should be mentioned that this can have many reasons. The first thing to note about this pattern is the fact that it is only a very small part of respondents that feel there have not been an opportunity for providing feedback, and that a large percentage still feel feedback has been evident within the process. Another point to make is that respondents were only asked if they, individually, have been able to provide feedback and not if others or possible team leaders have been able to provide feedback, which is likely as data change. A valid point could also be the time spent working with BI or how many work tasks it is being used for.



(Appendix 16, q. 6)

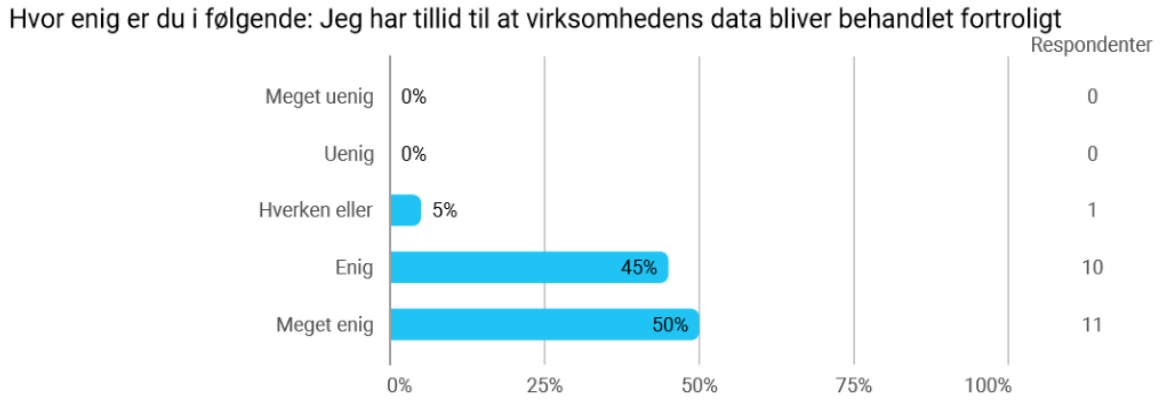
Within this it can be seen that only a minority of the respondents use it for most of their work tasks, which could potentially say something about the need for feedback options. Although this does not necessarily say anything about how often they use it, it can still be used as an indicator.

The overall patterns within feedback are patterns that in both theory, data, and observation describe the importance of feedback and evaluation for the solution to be valuable for the user. It is found in both theory and user interviews that feedback is vital in order to ensure that a solution stays effective and relevant over time. Moreover, it is found that there seems to be a pattern of personalisation, that feedback and evaluation is what makes the difference between a personalised solution compared to a standardised solution. However, patterns that speak against this can also be identified. Both patterns that speak of company priorities in terms of monetary and time consumption compared to results and value, but also patterns that suggest that a BI solution can be valuable even without the possibility of feedback.

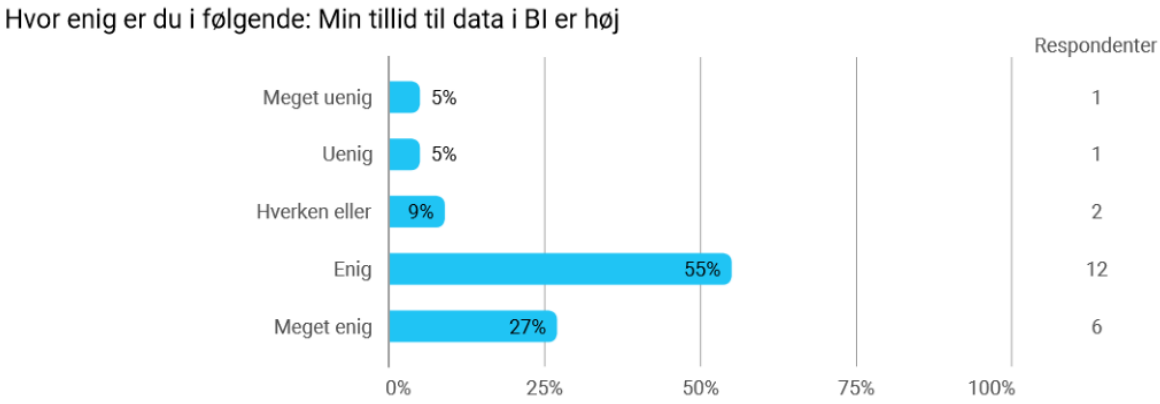
6.6 Trust

Trust is identified by Grubljesic and Jaklic (2015) to be of high importance for user acceptance (p. 304). If users do not trust the information provided by the BI solution it will not be used, and if a BI solution is not used it is neither effective nor valuable (Kaiser & Young, 2013, p. 2). In the

questionnaire trust is both about confidentiality of the data and about the correctness of data. According to respondents more than half trust that the confidentiality of the data is kept and trust the data itself.

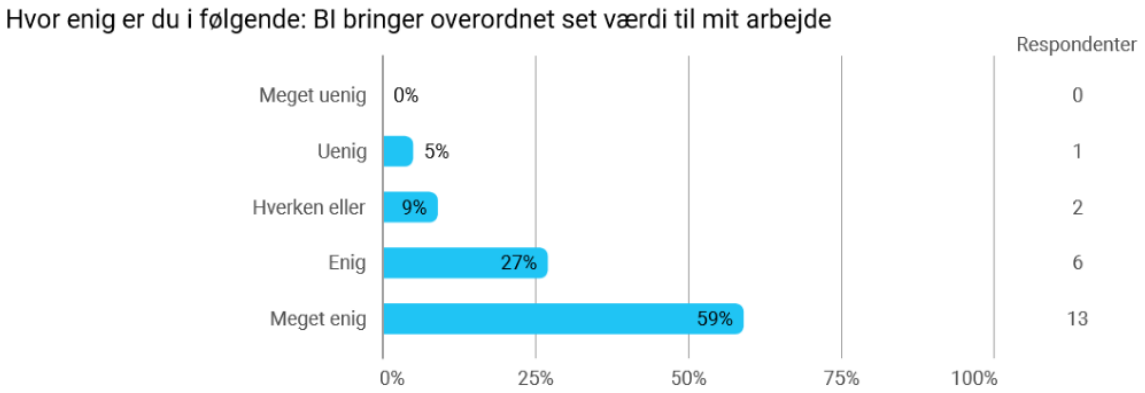


(Appendix 15, q. 35)



(Appendix 15, q. 27)

The pattern of the trust in BI and data seems to support the overall positive experience of using BI for work tasks which is analysed from question 30.



(Appendix 15, q. 30)

However, three respondents have provided an undefined neither nor answer about the trust and it may be because a respondent never considered trust or does not know if they trust the BI solution. Throughout the questionnaire, only a few number of respondents have responded a very limited knowledge about BI and less than a year or only one year of experience with using BI as mentioned previously in the introduction to the analysis (appendix 15, q. 3-4). Moreover, only one and two respondents have answered that none of their work tasks has become easier after the implementation of BI and a that some work tasks got more difficult (appendix 15, q. 17-18). It is not possible to exactly explain that these answers are related or that it is the same respondent answering these questions, however, it might be possible that they are related because it has resulted in respondents not trusting the solution. Most questionnaire respondents have trust in BI which is possibly dependent on other user involved variables such in these core categories.

Trust in BI might originate from internally developed BI solutions. According to user 3 the BI solutions has been built with trust and correctness in mind. User 3 do however, describe how the numbers and results in BI differ a small bit from the numbers presented in Google Analytics which according to user 3 should be the same (appendix 13, l. 231-241). However, because users are aware that there might be a small variable, users trust the solution. There is on the other hand, still a focus on that the trust originates from the solution being built and managed locally in the organisation. The same situation can be observed in user 4's interview (appendix 14, l. 105-111). According to user 2, trust can vary depending on the solution which has made this user and the related organisation change to another system. User 2 explain that data represented in the BI solution can not necessarily be trusted and she does not know how extern distributors handle

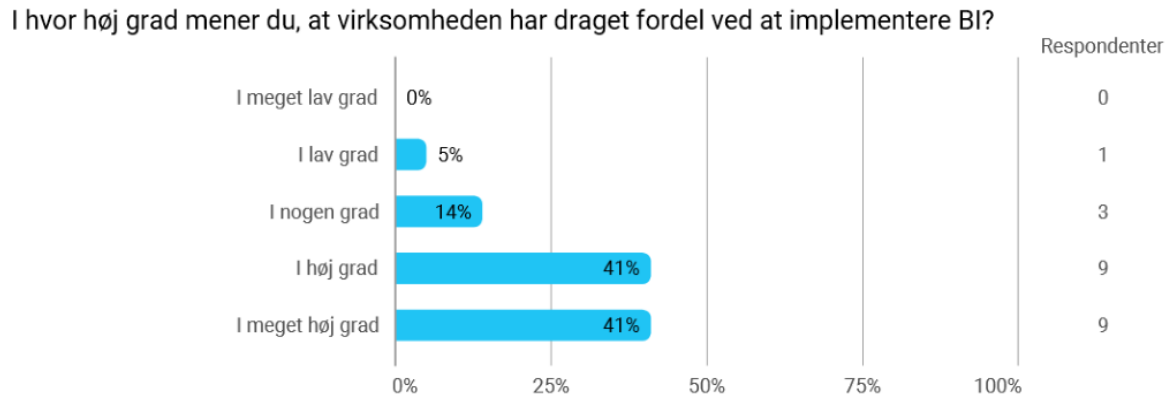
data. However, user 2 emphasise that it is not that relevant in this situation because the data that user 2 works with is not sensitive (appendix 12, l. 166-179).

Trust is in important within the value of a BI solution and participants value trust and the respondents of the questionnaire do trust BI and the data. If data is not trusted user 1 believes that it is not relevant to use the BI solution (appendix 11, l. 90-94) which is also the pattern among the other participants. Fink et al. (2017) also argue that the reliability of data is the one of the reasons that BI is effective for decision-making (p. 46). Trust is therefore another important pillar in the success of BI solutions in organisations but also something that will impact users effective use of a BI solution.

6.7 Value

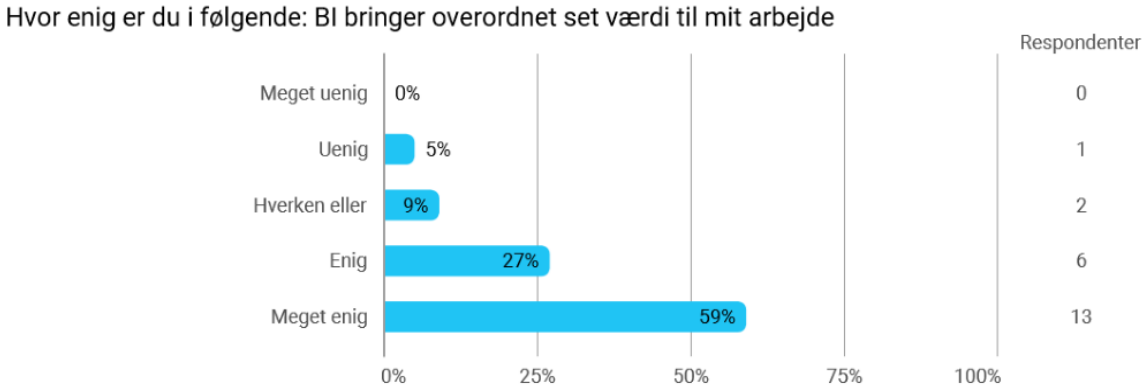
The value aspect is regarded both as an individual form of measure but also as an aspect that combines all of the core categories analysed in this chapter. Value is argued to be critical for the successful development, implementation, adoption and use of BI solutions in organisations. In order to create value, it is also argued that the BI solution must be used actively used in order for it to have and create value. Value is therefore dependent on several variables and user participants and respondents are asked how they value the use of BI solutions for solving work tasks and which variables that are important to users in order to create value for them. This will enable this study to argue in which BI processes it will create value for the overall use of BI solutions in organisations to involve the user. Value of BI solutions is in this study argued to be created by those who actively and efficiently uses BI solutions in the organisations. Therefore, it is important to understand how users should be involved in organisational BI solutions to use it effectively to create the overall organisational value of optimised decision-making and business procedures.

So far, there has been a pattern of positivity among the respondents of the questionnaire towards BI solutions. The participants of the user interviews are also generally experiencing it as important to involve users in the processes related to the core categories. The questionnaire asks whether respondents think that the organisation where they are employed has benefitted from implementing BI.



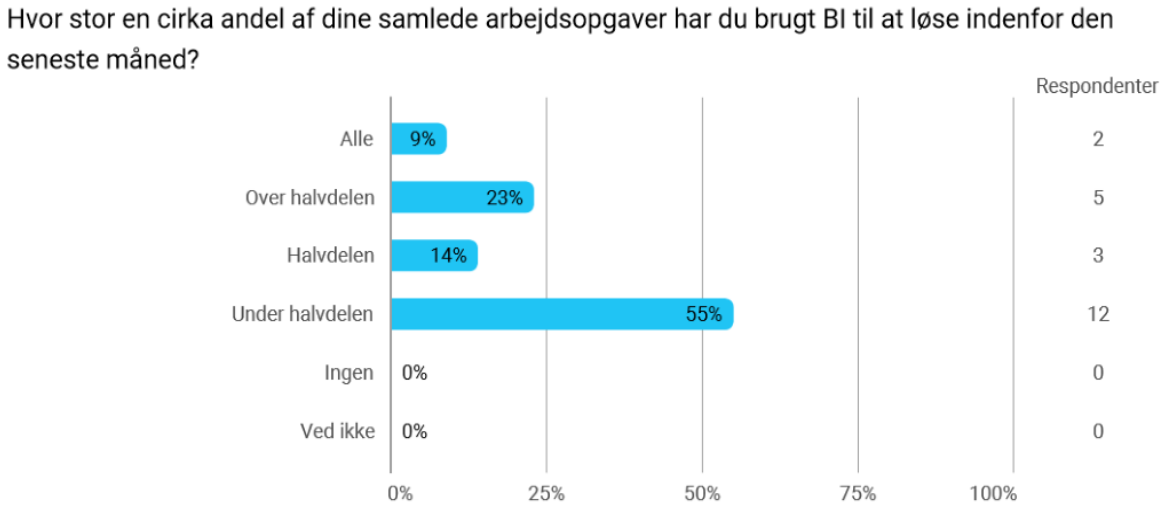
(Appendix 15, q. 13)

18 out of 22 respondents has reported that they to a high or very high extent believe that the organisation has benefitted from implementing BI. These respondents must therefore believe that they make an effective use of the BI solution. The last four of the respondents' answered that they to some or a low extent believe that the organisation has benefitted from the solution. As mentioned in section 6.5 Trust, these respondents might also be the respondents that does not trust the solution or do not believe that BI brings value to their work tasks or maybe only have worked with BI solutions for less than a year. The main observation however, in the questionnaire is still that BI has brought value to the respondents work tasks according to the respondents that either agree or highly agrees. One respondent however disagrees, and two respondents believe that it is neither or nor. To very few respondents BI has not necessarily brought value or eased any work tasks. The involvement of this respondent during the core category processes analysed in this chapter might be among the reasons why. This will be further discussed in the next chapter of this study.



(Appendix 15, q. 30)

It is however also relevant to analyse that 55% of the respondents reported that they use BI for solving less than half of their work tasks. However, 50% of participants still report that BI is very important for completing their works tasks and 19 out of 22 agree or highly agree that BI brings value to their work tasks.



(Appendix 15, q. 6).

Within literature, one of the problems related to the failure of BI projects is that organisations and managers expect the implementation of BI solutions to automatically solve business problems and that user acceptance is instant (Grubljesic & Jaklic, 2015, p. 306). The organisation therefore fails to meet the expected capabilities of BI (Bischoff et al., 2015, p. 6). However, in this questionnaire with respondents that overall values the use of BI despite it only solves only half of the work tasks for half of the respondents, users are aware of the potential and the profits of BI. In appendix 17, twenty respondents list which job tasks have become easier because of the use of BI, which means that these respondents and their organisation might have met the expected capabilities of the BI solution, or at least make good use of it to solve some works tasks. Among the work tasks, several respondents also mention decision-making, monitoring, and optimising. This could be argued to be related to the majority of respondents being able to provide feedback, that more than half received training, and more than half of the respondents has been involved to some extent in implementation- and development processes.

According to the distributor of BI solutions, the key to valuable and successful BI solutions is to get employees (users) on board (appendix 10, l. 97). Motivation to use BI solutions

and use them efficiently, comes from making users understand how they individually contribute to the entire organisations benefit from the BI solution. In order to motivate, all users also need to believe that it is a valuable and good tool to apply (appendix 10, l. 97-105). According to the distributor of BI solutions, it is imperative to get the users to believe that BI is a collective strategy and success, as also emphasised by Rosenfeld et al. (2015) that users must function as the allies of the BI project for those implementing it (p. 334). As argued by Tamm et al. (2013) it is not the information produced by the BI solution that creates value, it is the use of this information by users that results in enhanced decision making, solving work tasks and business action (p. 2). User 1 is impressed by the BI technology and the possibilities it creates for the organisation, however, it is also said in connection with "når først vi får det ind under huden og får lært at håndtere det" (appendix 11, l. 136-137) which emphasises that the users and relevant employees must first be involved in the process and learn the tool.

User 2 also emphasise the it is important to learn to use the data properly in order for it be valuable and in order for BI to function "ligesom at få briller på så du kan se lidt skarpere" (appendix 12, l. 198-199). On the other hand, user 2 is not as inclined to be instantly positive about BI as the other participants. User 2 argues that in an organisation that is strongly managed and operated based on data and statistics from BI, it could possibly be problematic for the employees whose projects, work tasks etc., that will be terminated because BI displays performance about products or production (appendix 12, p. 207-223). In other words, the human factors are possibly not considered or investigated when work tasks are mainly data driven. It might be the best solution for the profits of the organisation but not for users or employees. This presents an issue within BI, because it is not only during implementation and development that users should be involved in the BI solution and process. It is also during the continuous management and use of BI. However, this aspect is highly reliant on the organisation and management level to prioritise and manage in between the data driven and human factors. It may however, be useful to also consider this human aspect among users because some might be reluctant to use BI solutions because of this experience or knowledge.

If developed and implemented correctly and you learn how to use it beneficially and appropriately, user 4 also regard BI as very valuable tool (appendix 14, l. 129-132). The same answer is also prevailing in the user 3 interview. User 3 focus on the trust in data and that it must be reliable in order to valuable (appendix 13, l. 223-228). Based on this analysis of the core

categories, development, implementation, training, feedback, trust, and value from the perspective of participants in interviews and the respondents of the questionnaire it is possible to see a pattern between user involvement and the valuable use and understanding of BI solutions on organisations. In this section about value, participants and respondents' value BI solutions for business optimisation but also to solve individual work tasks. Within the questionnaire there is a pattern between respondents being involved in several processes related to BI and value the BI solution in their organisations. User participants continuously refer and argue for the involvement of users within these different processes and the value and potential of BI of users in being actively engaged and involved in different processes. All participants also mention their own personal examples of situations where users are not in some way included or involved which leaves some users behind. There is a relevant agreement between the questionnaire and user interviews. Both methods demonstrate the potential of involving the user as an important variable in order to create more efficient and beneficial BI solutions in organisations.

Chapter Seven: Discussion

This chapter will outline how this thesis has contributed to the academic and literary field of BI and users by examining and discussing the contributions of theory, methodology, and practice. The theoretical contribution will discuss the use of theory in relation to the results and findings from the analysis and examine how theory has contributed to a further understanding of the project. The methodological contribution shall discuss the advantages and disadvantages of the choice of methods and how the triangulation of methods has resulted in different findings. The last section will examine the practical contribution of this study and how it can be used in other similar examples.

7.1 The theoretical contribution

This section will discuss this study and its analysis according to theoretical arguments presented in chapter two. One of the main goals of this study is to somewhat establish and support the argument that the user is an important variable if organisations want to use BI solutions effectively and optimise business procedures but also create the best foundation for implementation and adoption of BI solutions for the users. It has been analysed that users value to be a part of the different processes related to BI development, implementation and adoption in order to use the solution fully. Users also experience that the involvement of users in BI solution processes of adoption is relevant for users to use the solution effectively. One of theoretical arguments presented is that value of a BI solution is created by those who actively use it. As argued by Kaiser & Young (2013) the occurrence and understanding of value is up to each individual. In relation to BI solutions, value is determined by users when the expectations of users are met. According to the users in this study they expect to part of development and implementation processes of BI solutions in order to adopt and use it efficiently, in other words become valuable for the user. It makes sense to these users to be asked and included during these processes because their understanding and experience of the BI solution is expected to become better because of the involvement. Users value to receive training in using a BI solution because they expect that users will be trained to use it more efficiently, than if training had not occurred. These expectations of user involvement all relate the theoretical fundament that value for user will lead to optimised and effective use of a BI solution and create value for the entire organisation.

This thesis also included the concept of CSF. The concept is inevitable when researching about users of BI and therefore relevant to include in this study as well. This study does not argue or seek to determine the user as a CSF for BI solutions, however, it can be discussed whether this study could complement the limited literature in the role of users in the success of BI solutions. As pointed out in theory, value and success are interrelated and if there is success there is value, and if there is value there is a foundation to achieve success. The terms are not the same or equal but both concepts occur in the efficient use of BI solution and it is argued in this study that in order to be efficient, the BI solution must be valuable for users. The BI solution must also be valuable for users to create success for the organisation. Gaardboe (2018) outline that the study of CSF informs which criteria that must be fulfilled during the implementation and continuous operation of a BI solution in order to be successful (p. 37). The study of CSF is however, according to Gaardboe and Svarre (2018b) missing extensive literature on the role of user involvement in the success of BI solutions and point out that BI can be a resource for any organisation but users and information use can affect the success of IS (p. 6). As also identified in the literature review of this study, few studies involve users by using qualitative methods such as interviews. Therefore, it is possible to reveal some knowledge about users of BI based on this study. Users are relevant to study regarding CSF because users could possibly be one of the critical factors. In this study, it is argued that users are in important variable to consider in order to create effective BI solutions. This suggests that the user should be further investigated to support the user as a CSF for BI. The role of the non-technical aspect of success in BI solutions is still unknown to the extent that it cannot be dismissed that the users could be a CSF and that lacking understanding and investigation of users account for an important role in the significant failure rate of BI solutions in organisations (Gaardboe & Svarre, 2018b, p. 1-2; Adamla & Cidrin, 2011).

Continuing to discuss the success of BI solutions, Ain et al. (2019) claim that the D&M IS success model (DeLone & McLean 2003, pp. 15-16) is one of the most cited models to assess IT success (p. 6). Many scholars have used the D&M model to explore BI success, however in 2019 the investigation of human factors in BI is still "largely ignored" (Ain et al., 2019, p. 7). The D&M model pose a contradiction in relation to this study and resulted in not conducting a study by applying the D&M framework. Applying the D&M IS success model seems to naturally exclude the study from being user-centred or user involving. Several studies, as identified in the theory section, argue that the D&M model is lacking in several areas, especially regarding the

users and cannot fulfil to explain or evaluate the role of users in the success of an IS. On the other hand, if this model is the most cited framework within measuring BI success it must have some advantages. The framework is most famous for being used to measure success within IS which includes many other areas than BI. It is therefore interesting how the user can constitute for such a vague role within the D&M model. Some scholars argue that it is because the model focuses more on the technical aspect than the human aspect which is seemingly true. The D&M model determines three criteria to achieve User Satisfaction and Intention To Use. However, the model implies that first you develop and implement and then you test and evaluate the user. The model does not imply that to have Information Quality depends on the information that the user needs to solve their work tasks and that this is where the process should begin, by including the user instead of doing it as the last or finishing part of a BI project. If the Information Quality, System Quality, Service Quality is developed and implemented without the user in mind it will not provide user satisfaction and knowing the user from the beginning of a process could provide higher probabilities to ensure successful implementation and adoption. Adamala & Cidrin (2011) argue that the reason the D&M model cannot assist a user-centred study is because the model does not have the user in mind during the entire process. Based on findings from the analysis, it is argued that is an advantage to include the user from the beginning and that users also value to a part of the processes related to BI implementation and adoption. When users value this process and their expectations are realised, the use of BI solutions will be more efficient and benefit the entire organisation. The D&M model is not designed with the intension to include users during the entire BI project process and therefore not applied as theoretical framework.

This study contributes to investigate the field of BI and users from a new perspective and a new theoretical approach. Many studies have applied the D&M IS success model to evaluate BI success which also determines that BI systems can be argued to some extent classify as an IS. When dealing with an IS it is important to deal with the structure, build and organisation of information. This is one of the main characteristics of IA and it was relevant to include IA to argue for the relevance of users in BI solutions in different way than previously done. IA manage information by using different approaches, however a main approach is the focus on users. IA makes it possible for this study to take a point of departure in users and to investigate these to understand how information should be managed and displayed and shaped in order for users to make most use of it and be satisfied with the result. Theory of IA seeks to create meaningful

information, and information becomes most meaningful when it is adapted to users. For BI, the three circles of IA (Rosenfeld et al., 2015, p. 32) illustrate the three concepts that must always be kept in mind during the entire process of building, developing, implementing and adopting a system that provides information to users. The analysis has demonstrated the it is valuable to users to be a part of these different processes and when asked, participants argue that it would result in the most useful BI solution if users are involved during the entire BI solution processes. Participants and respondents demonstrate a pattern of agreement about the potential of BI solutions in organisations and the BI distributor also argue that knowing the user and the user needs is one of the keys to successful BI use. IA has made it possible to place the user in relation the BI solutions and that distributors and developers should be in contact with users and seek to know them (users) and the organisation (context) to create the most efficient BI solution.

On the other hand, it might be possible to argue that using IA has ignored the technical aspect of BI solutions. However, literature demonstrate that the technical quality and function of BI is well supported and investigated within BI literature, and that a solid technical foundation and structure, or data management is also important. IA however contribute to argue that the technical aspect must also include the user for technicians to develop solutions that are targeted at users, good usability and good user experience. In order to do this properly, the users must be involved. HCI also contribute to connect the focus of the technical (computer) and the user (human) aspect and overall emphasise that these two aspects are interrelated and dependent upon each other. HCI is the theory that also ensure the efficient interaction between the user and the technology. Kim (2015) argue that high usability and efficient interaction "will lead to easy to use technology, efficient tasks, safety and correct completion of tasks which will result in high productivity" (p. 1-2). This should be the main goal of BI solutions to ensure the most valuable solution for users and therefore a valuable solution for the organisation. HCI also contribute to understand the challenges there might be related to the interaction between the user and the technology and how it might lead to demotivated users that will not use the technology. The analysis also outlines the participants concern about users that are not properly introduced, involved and trained in using the BI tool and how it can lead to users using the tool inappropriately, ineffectively or not at all. To understand the interaction is to learn about the user and it is important for the outcome of the BI solution and for the organisation according to participants of the data collection.

This study has applied new theoretical concepts to approach the study of users within the context of BI solutions in organisations. HCI and IA has presented strategies of how to understand and include the user when investigating the efficient use of BI solutions. The core categories chosen to investigate throughout the collected data are natural to IA and HCI and the application of these core categories are also emphasised in additional literature as described in the theory chapter. HCI and IA are relevant because literature is not concerned with the non-technical or human factors of the successful use and implementation of BI solutions and HCI and IA strongly assist in understanding the importance of the human factors in BI solutions and how human factors can affect the efficient use of BI solutions in organisations.

7.2 The methodological contribution

The analysis has identified the reality of the users and their experience of the interaction with a BI tool, which has been made possible because of the applied methodological triangulation. It has been necessary to combine several methods in order to achieve results that would answer the research questions and the thesis would have had several weaknesses if the methods had been applied alone. The mixed methods approach to this study is not necessarily a bulletproof solution without disadvantages however, it is argued that the method triangulation has been chosen to create the strongest foundation for data collection and the achievement of interesting and valid results. The use of triangulation in this study is applied to study the phenomenon of users in the context of BI solutions in organisations. One of the methods contributing with many advantages is the use of qualitative methods. Qualitative interviews have made it possible to experience and understand the phenomenon of users applying BI solutions for daily work tasks. This experience was very important to achieve the result that users value involvement in BI implementation and adoption and to suggest in which processes the user should be included in and how. Qualitative interviewing was also important to include because other user-studies rarely applied interviews to investigate and understand user, which is argued to be very important and validating for this study. The use of interviews in this study did however, present its disadvantages during the development of this thesis because the method is generally time-consuming. Planning, transcribing, and developing interviews is a time-consuming process which also resulted in only four user interviews in this thesis. Recruiting participants takes time and you must respect participants busy schedule when planning the interviews. It is not considered a source of error of this thesis that it only includes

four user interviews, but it would have been possible to achieve more and generalising results if more users had been included in this study.

To properly know which methods other studies used and how, it has been very important to execute a literature review. The literature review disclosed the focus of other studies and their use of methods which also inspired this study. The review also had a systematic approach to find and collect data which made necessary requirements for the review and ensured that two databases were searched for relevant literature and disclosed the area of BI and users. The literature review determined the area of investigation and showed that the academic foundation for studies of users and BI was lacking and made it possible for this study to take a point of departure in an academic gap.

To support the qualitative interviews in numbers it was decided to also include quantitative methods to gather more information on users. Combining the qualitative user interviews and quantitative questionnaire created a somewhat solid number of respondents to this thesis and assisted in achieving more measurable and tangible results. The questionnaire supports the interviews and the findings generally in relation to the number of respondents and the very specific measurable results it provides. However, the questionnaire also discloses some disadvantages because it is not possible to ensure in the same way as the interview, that respondents are appropriate and relevant and understand the questions in the same way that the students behind this project does. The recruitment strategy was convenient sampling for both interviews and questionnaire, however, as the questionnaire is anonymous it is impossible to know the users and connect patterns between them. During the analysis there is only a few respondents that did not receive implementation or training and a few that does not reckon the BI solution to have made any of their work tasks easier. However, it is not possible to say that it is the same respondent throughout the questions and the questionnaire provides some uncertainty in the results. The questionnaire cannot guarantee that the results agree with the analysed findings. It is on the other hand, still argued that because a pattern exists between the users of interviews and the respondents it is possible to interpret that having been involved during the processes related to BI implementation and adoption leads to valuable solutions for the user. This finding was not possible to establish without the combination of the qualitative and quantitative methods and in this study both methods would have been insufficient alone.

The interpretivist/constructivist approach has made it possible to use a deductive method of investigation with our theoretically based core categories that allowed for the understanding of users and their experience with BI solutions. It has been possible to compare the results with knowledge about BI, but primarily about users. However, the notion of 'experiencing' users is also achieved with the interpretivist/constructivist approach and by using the additional categories, we discover themes that users mention, that was not theoretically based on knowledge known by the researchers before analysing the data collection. The discussion of qualitative and quantitative method, the systematic literature review and the overall interpretivist/constructivist research methodology has all collectively contributed to the results of this thesis. The interviews and questionnaire reveal many meaningful and interesting findings together, which was also only possible by using the literature to define the area of research and which themes to focus on during the data collection. The research methodology allowed for this mixed methods approach and for the combination of beforehand known knowledge about users and the discovery of users' perception of a user's role during the development, implementation, adoption and use of BI solutions in organisations. The combination of these methods results in interesting findings in this area of BI and users in association with all the research methods advantages and disadvantages.

7.3 The practical contribution

This section aims to clarify the practicality of BI solutions and discuss what this study is able to conduce with regards to building and implementing a BI solution in practice. It will present knowledge retrieved from observation, theory, and data within the study in order to present a discussion of ideas that is valid to incorporate when building and implementing a BI solution in practice.

7.3.1 Knowing and understanding the user

It is interesting to discuss the aspects that comes before any development or implementation. Within this study additional categories have been presented; these are categories that were found of importance while investigating the collected data. Within the data and the additional categories, a pattern of user knowledge emerged, a pattern that suggested that background information and knowledge of the user is of importance to a BI development and implementation process. Rosenfeld et al. (2015) argue that within IA there are three circles valid to consider achieving good

IA, these are Context, Content and Users (p. 32). These are essentially aspects that are worth considering prior to and during any a development process to ensure satisfaction for both users and stakeholders. Within the concept of BI, no such theory exists with regards to either user or stakeholder. With the additional categories found in data and the theory of IA as presented by Rosenfeld et al. (2015, p. 32) in mind, it is valid to discuss if these are aspects and categories that should be implemented within a BI context. It should be noted that within theory of IA, all aspects are considered, whereas this study concerns itself with the user, and operates only within a user context. The argument that can be made for the inclusion of this within the context of BI solutions is the gain that it encloses for the overall project. It enables the developer and distributor to understand the user's starting point before beginning the actual development. Furthermore, it enables the user to express their knowledge to the developer and distributor, enabling them to be a part of the process from the beginning. It can be argued that a BI solution made to accommodate a user that have 5+ years of experience with BI is vastly different than users with less experience or a company of first time BI users. Furthermore, it enables the developer and distributor to understand the frequency of use that the solution should be designed for, again an argument can be made for the fact that a system used daily is designed and developed differently than one used once a month. Within the data analysis chapter, it was found that there seemed to be a correlation between years of experience, frequency of use and overall value (Appendix 15). The argument is not that the process of background enquiring is not a part of development process, the argument is that it should be more displayed within theoretical and methodological literature on BI. This would ensure a repeatable process that could continuously be used to secure these aspects and to improve the possibility of overall value in BI solutions. Furthermore, more established method and theory about this would enable researchers to constantly evaluate this method and add or subtract aspects from the method and theory, much like it is possible with the example of IA as presented by Rosenfeld et al. (2015, p. 32). In a practical setting such background enquiring could be achieved by use of simple interviews or questionnaires.

7.3.2 The core categories of value and how to involve the user

Within the data analysis of the study an overarching pattern of inclusion and involvement was found. Showing that not only does theory support the idea that users should be involved in the core categories, but also that users, respondents, and distributor agree with this fact. The pattern

demonstrates that not only can these categories be seen as having a benefit if they make include user involvement, but also that users wish to be a part of these categories in order to make the solutions feel more personalised and easy to understand. This is also found to be equivalent to more value within a finished BI solution, both for user and organisation.

The next question to answer is then how to make the user a larger part of these processes. It is relevant to examine existing theory, where it is described that these processes and strategies should seek to involve and question the user on aspects of usability, design etc. Grubljesic and Jaklic (2015) argue that it is important to find a way to make use of user participation in development, implementation etc. as this in turn can optimise these processes and the result (p. 304). Furthermore, this point of discussion and contingency derives from the data found; "det er også vores rolle når vi kender kunderne og virksomhederne at rådgive om det" (appendix 10, l. 64-65), where the distributor argues that the involvement of users becomes a part of their responsibility.

On this issue this study argues that it is possible to create a call and response model, where the developer and user during the development, implementation, training and feedback process partake in a constant and continuous flow and sharing of information and ideas between them. This is illustrated in the model below.

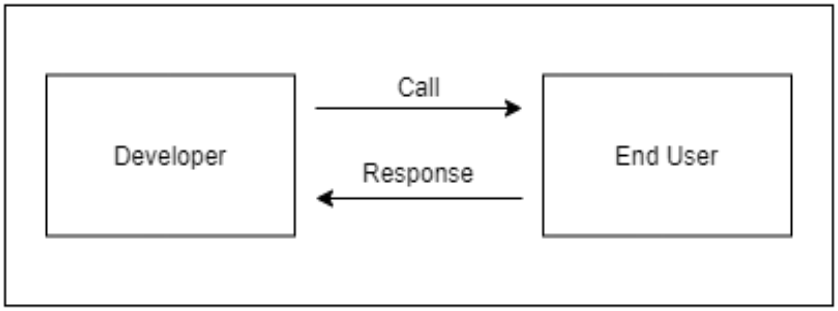


Figure 6: Call and Response model for user involvement in BI solutions

By employing this model, it would be possible for the developer to be in constant coherence with the user or users of the solution, which as revealed earlier is important in creating and developing the best product for the user and organisation. It would in turn allow the user to have input and say in the development, implementation and evaluation of the solution and make the solution feel as personal and customized as possible. It would further, enforce the collaboration between developer

and end user. This model is not a method, it does not aim to describe how a call and response relationship should be achieved, the model acts as a framework that can encapsulate various methods. The model enables the developer and distributor, in coherence with the customer to apply different methods that ensure a call and response relationship, such as interviews, meetings, written feedback, walk-along, workshops etc.

The argument that can further be establsihed, is that by involving a user, and in turn the organisation in these processes could potentially increase the trust of a system and the trust in the data within that system or solution. Trust is argued to be of great importance, as it needs to be present within a solution and for the users for a solution to have validity to it. By employing a model or framework like this, it would ensure that the user and organisation would constantly be up to date with all that goes on in the solution. Another point that can be drawn from this is equivalent to the argument made in 7.3.1 that although these aspects might be considered by some developers and distributors when creating and working on a BI solution for a customer, it needs to be displayed more efficiently. There is a lack of theory and methodology of these areas within the field of BI, and by employing a model and subsequent theories as the call and response model, one can ensure that theory and methodology is carried out and followed in practice. It further allows for the scrutiny of these in order to continuously optimise these methods and theory.

7.3.3 Theory and methodology versus practice

The analysis chapter section 6.5, user 3 present the argument about money, time and priorities when the user explain "… sådan en vurdering af hvad det er værd I tid … bliver ihvertfald sådan en snak om hvad er outcome i forhold til hvor meget vi lægger i det" (appendix 13, l. 188-190). Within this discussion of both the value of user involvement in these different phases and processes and how to do this, this becomes a valid point of discussion. User involvement might be a good idea from the perspective of a user, and developer with regards to value. Another consideration is what the organisation is willing to sacrifice both in terms of monetary sacrifice but just as much in terms of time and prioritising of work tasks and business strategies and goals. It is a very valid point of contingency for the idea of user involvement. For a company to successfully implement the ideas as presented within this section they must be willing to make sacrifices within these fields. It can both be that a company is not convinced that these considerations are needed, that they simply do not have the financial matters to support it, or the time to take away from other

work tasks. However, this issue backs the points made in the previous sections, that there needs to be more focus on the importance of user involvement in BI both in practice but also in theory and methodology. An increased focus on these will allow a developer or distributor to easier manifest the idea that these are of great importance and thereby convince an organisation that they are necessary.

Chapter eight: Limitations and Future Research

This chapter discloses the limitations considered and discovered throughout this study, because it is important to be aware which limitations and source of errors than can affect the results of this study. The chapter also outlines the suggestions for future research to possibly avoid some of the limitations that has been experienced in this study.

8.1 Limitations

This study seeks to complement the academic and literary field of BI and users by demonstrating new theoretical approaches to study users of BI and to complement an ignored field within literature. The study does not apply many respondents and in order to generalise findings more respondents and participants would have been necessary to include. This is not considered a flaw within the study however, it is a limitation to the results. Due to the extensiveness of executing interviews and technically constructing a questionnaire it was decided to only include the four user interviews and close the survey three weeks before deadline because the process of managing, transcribing, analysing and interpreting are time-consuming processes and in order to have enough time to investigate the data deeply. The amount of empirical data collected was as mentioned not extensive and makes it difficult to present general conclusions and findings. Another limitation to this is the recruitment of respondents to the questionnaire because it is not possible to know or control these respondents. The questionnaire and the validation of the first two questions within the questionnaire (explained in chapter 3, section 3.6.1) should ensure appropriate respondents, this is however not entirely possible, which is another reason the conclusions and findings of this study is not attempted to be generalised.

As mentioned in the discussion of triangulation of methods and the contribution hereof, it is important to be aware of the limitations and sources of errors that was experienced during the development of this study. Regarding methods it is found to be of importance to mention, that pilot testing interviews was not conducted. The user interviews were not tested on any relevant or non-relevant participants before executing the first interview but made few moderations to the interview guide (appendix 8) after the execution of the first interview. It is

however, argued that because the interview is an SSI it was possible to adapt the interview during the conversation with a participant. On the other hand, it would still have been preferred for the validity of the interview to have tested it beforehand with a relevant test user, to know if any questions or themes could have been elaborated or extended or should have been asked in another way. The interviews were, furthermore, conducted mostly by phone and videocall except for one interview. However, there has not been discovered or observed any of the differences in the user interviews as described by Bryman (2012c) the researches must be aware of (p. 488), and it should not have affected the results of the study. During the recruitment of respondents, it might have been beneficial to be more specific or discerning about the choice of both respondents and participants to have a clearer knowledge about users. However, it was considered that the knowledge about users and this study's approach to include users was very different than other studies of BI and users, and the focus was therefore not a specific kind of user in a specific kind of organisation. The focus was to simply achieve an understanding of any kind of user that is employed in an organisation and applies BI solutions to solve daily work tasks and the requirement for recruitment was kept simple, but it may be a limitation as it is not possible to say anything about a specific kind of user or organisation and relate the findings from data to a specific user or organisation.

A source of error that must be mentioned, is the work experience that respondents of the questionnaire has with BI solutions, as mentioned as one of the additional categories. More than half of respondents has worked with BI solutions for three years or more. The generally positive experiences with BI might be related to the result that most users are very familiar with working with BI solutions. The results may therefore also be biased from the fact that the positivity is not related to respondents having been involved during the implementation or might have been able to provide feedback, but because they are very familiar with the tool. In future research, it might be an advantage to conduct this study with users or organisations that recently implemented a BI solution.

The literature review ensured that a relevant field about BI and users had been researched and cleared in order to define this study. However, the literature review could have been conducted with more databases or with another set of search terms. The search terms as seen in appendix 1, naturally discloses the area that we took a point of departure in through this study. The study focuses on the term "business intelligence" with the synonym 'data warehouse' which

includes relevant papers about BI. For the user part it might have been an advantage to include more specific search terms other than about the users. Search terms such as 'work tasks', 'tasks', 'success', or 'value' might have included some relevant papers for this study. The literature review presents many advantages for this study, but it does not guarantee that all relevant literature has been discovered, also because of the limited use of databases. On the other hand, this area of BI users is still very undiscovered and therefore the search conducted in the literature review is relevant and appropriate for this study, but for future research more specific search terms might be defined and included.

8.2 Future Research

This section aims to clarify which areas and perspectives would be of interest to research within the field of BI solutions. Future research is considered to avoid some of the limitations that this study has discovered but also to investigate areas that is related to this study, but not answered in this study.

The first aspect that holds potential interest for future research is a switch in perspective between user and developer/distributor. This study holds a sharp focus on the user of BI solutions and does not conduct any conclusive research from the perspective of a developer or distributor. This in turn means that the study tends to focus on the humane aspects of BI development, implementation, training, feedback, trust, and value, and does not regard the technical aspects of these. The study draws conclusions and patterns within these topics, that are all topics that have a potential to be of a technical nature as well as humane. Furthermore, it is important to note that for any software solution, including BI solutions, to be of overall value all aspects of this must be counted for, this goes for the technical aspects of it as well. Within the study, it is found that patterns show that a greater focus on user involvement can potentially increase the value of a BI solution for user and organisation. However, it would be of interest to investigate whether these aspects also would be of benefit to a developer and or a distributor or if they would be a hindrance to these processes from that specific perspective, and if compromises had to be made. It could potentially be seen as a challenge for a consultant company to lend even more time to the creation of a solution than they already do, as it would then become a question of time, money and priorities for them as well.

Another aspect that would be interesting to conduct research on, that can be achieved without a shift in perspective, would be to hold a more strict or narrow recruitment. Within this study a convenience sampling was adopted to gain as many users and respondents as possible. However, it would be of great interest to do a stricter sampling that would sample more specific users and respondents to create validation and conclusions for specific users and identify patterns between them, and not for users as a general term. The concept of a user is something that can hold many different variables and it is to an extent important to note that users are different in many ways. This research could be achieved by focusing on experience, age, size of company, profession etc. This would ensure that more generic models, frameworks, and theories presented within this study could be narrowed to fit a specific group of users. It would be of great benefit for the field of BI to understand if users are different to an extent that would find it necessary to change approaches to these core categories. It would moreover within this be interesting to do research on the findings of core categories within BI solutions. This study applies a deductive approach with roots in theory. However, it would be of interest to focus on the data collection within this as well in order to investigate if these are agreed upon by the users of BI solutions.

Chapter nine: Conclusion

With a point of departure in the literary field of BI and users, it has been possible to establish that the area needed further investigation. It is inevitable to ignore the immense potential of applying BI solutions in organisations. As a tool, BI is argued to optimise decision making, reduce uncertainty, and make business procedures more effective. The expansion of BI solutions throughout the last two decades has experienced increased growth because of the awareness of these potentials (Ain et al., 2019, p. 1-2). However, within literature and academia it is difficult to identify the role of users in effective and efficient use of BI solutions. The study therefore investigated users of BI to identify how users' value and experience the application of a BI solution to solve daily work tasks. The research questions outlined in the introduction are defined as:

1. *How is the field of BI users represented in current academic literature?*
2. *How can it be argued that the user is an important variable in creating more efficient BI solutions in organisations?*

The research questions are interdependent as the identification of the academic gap led to the investigation of the importance of user's role in efficient and valuable BI use in organisations. However, the second question also occurred because of the theoretical background as information architects. Within IA and HCI there is an increased focus on users throughout the processes related to the development, organisation, structure, adoption, and use of information and this focus is argued to be of vast importance for the quality and value of the IS. It is therefore also argued throughout this thesis that for a BI solution to be efficient and valuable for the entire organisation, it must first be valuable for the user and information must be designed with the user in mind.

To obtain this knowledge it was decided to include users of BI solutions by applying methodological triangulation. Combining qualitative and quantitative methods in the form of user interviews and a questionnaire, enabled the study to achieve an understanding of users. The questionnaire reveals the cohesion between involvement in core categories and the positive experience of working with BI to solve daily work tasks. The interviews revealed that users value to be a part of the processes within core categories and believe that motivated, trained and involved

users make most use of working with BI and therefore contribute to create a valuable BI solution for the organisation. User motivation derive from involvement during development, implementation, and adoption processes and users believe that this is the most beneficial way to use BI solutions efficiently. Combining the findings from user interviews and questionnaire complement each other due to the questionnaire supports the more in-depth results from the user interviews. The theory that user involvement creates more efficient solutions is supported by the questionnaire and user interviews reveal that users also value, prefer and believe that user involvement achieves efficient use and output of BI solutions.

Other than the core categories found to be of relevance within theory on users, IA and HCI, additional categories were found during the investigation of the collected data. These categories were found using an inductive method to analyse which categories were revealed as essential for users and respondents. The additional categories revealed that the disadvantages, potential, frequency of use, and experience present in a BI solution tended to have a user focus as well, for example with regards to disadvantages it revealed that if users were not involved properly it would become a disadvantage to the BI solution.

This thesis contribute to illuminate the role of users in BI solutions in organisations and argues that for the BI solution to be efficient and effective the user must be involved and prioritised because it is the users that actively engages with the BI solution that determines the value of it. Adamala & Cidrin (2011) argue that non-technical problems serve as a major factor in the failure of many of these BI projects (p. 125). By asking users of their experiences with BI solutions it is argued that the users constitute a very important variable in creating more efficient BI solutions in organisations. The are many important variables to consider when developing and using efficient BI solutions and the users are one of them. As presented within studies of CSF for BI systems the technical and organisational factors are critical, but the role of users within BI CSF is so far unclear and rarely investigated. This study therefore also suggest that more studies should be conducted to investigate whether users could be identified as a CSF for BI systems. The study has been able to argue for the value of including users by analysing interviews and a questionnaire, by taking a point of departure in gaps in the literary field of BI and users as argued by several scholars. The findings will contribute to the academic field of user investigation within BI but also complement the practical area of BI and users in suggesting that users are involved during the processes related to development, implementation, adoption and continuous use of BI solutions in

organisations. Users are unpredictable and have different needs, attitudes and behaviours. Therefore, BI solutions must be personalised and customised to each organisation and the relevant users. It is necessary to know the users and educate users in applying BI for their work tasks as well as knowing the organisation. These recommendations apply both for the distributor of BI solutions and the organisation that seeks to apply efficient BI solutions and attain the expected capabilities of the solution.

List of references

Adamala, S., & Cidrin, L. (2011). Key Success Factors in Business Intelligence. *Journal of Intelligence Studies in Business, 1*, 107-127. Retrieved from https://ojs.hh.se/

Adams, W. C. (2015). Conducting Semi-Structured Interviews. In K. E. Newcomer (Ed.). *Handbook of Practical Program Evaluation* (pp. 492-505). Retrieved from http://ebookcentral.proquest.com/lib/umanitoba/detail.action?docID=2144898

Ain, N., Vaia, G., Delone, W. H., & Waheed, M. (2019). Two decades of research on business intelligence system adoption, utilization and success – A systematic literature review. *Decision Support Systems, 125*, 1 -13. https://doi.org/10.1016/j.dss.2019.113113

Bhattacharya, H. (2008). Research Setting. In M. L. Given (Ed.). *The SAGE Encyclopedia of Qualitative Research Methods* (pp. 788-789). Retrieved from http://dx.doi.org.zorac.aub.aau.dk/10.4135/9781412963909.n398

Bischoff, S., Aier, S., Haki, M. K., & Winter, R. (2015). Understanding continuous use of business intelligence systems: A mixed methods investigation. *JITTA : Journal of Information Technology Theory and Application, 16*(2), 5-37. Retrieved from https://search-proquest-com.zorac.aub.aau.dk/docview/1724988603?accountid=8144

Brinkmann, S., & Tanggaard. L. (2010). Interviewet: Samtalen Som Forskningsmetode. In *Kvalitative Metoder: En Grundbog*. Hans Reitzels Forlag. (pp. 29-55). Retrieved from https://books.google.dk/books?id=GMZY0OFtxH8C&dq=Interview:+Det+kvalitativ+forskningsinterview+som+h%C3%A5ndv%C3%A6rk&lr=&hl=da&source=gbs_na links_s

Bryman, A. (2012a). Asking Questions. In *Social Research Methods* (4th ed., pp. 245-267). Retrieved from https://www.academia.edu/35174091/Alan_Bryman_Social_Research_Methods_4th Edition_Oxford_University_Press_2012_

Bryman, A. (2012b). Focus Groups. In *Social Research Methods* (4th ed., pp. 500-520). Retrieved from https://www.academia.edu/35174091/Alan_Bryman_Social_Research_Methods_4th Edition_Oxford_University_Press_2012_

Bryman, A. (2012c). Interviewing in qualitative research. In *Social Research Methods* (4th ed., pp. 468-498). Retrieved from https://www.academia.edu/35174091/Alan_Bryman_Social_Research_Methods_4th_Edition_Oxford_University_Press_2012_

Bryman, A. (2012d). Mixed methods research: combining quantitative and qualitative research. In *Social Research Methods* (4th ed., pp. 627-651). Retrieved from https://www.academia.edu/35174091/Alan_Bryman_Social_Research_Methods_4th_Edition_Oxford_University_Press_2012_

Bryman, A. (2012f). The Nature of Quantitative Research. In *Social Research Methods* (4th ed., pp.160-182). Retrieved from https://www.academia.edu/35174091/Alan_Bryman_Social_Research_Methods_4th_Edition_Oxford_University_Press_2012_

Bryman, A. (2012g). Qualitative data analysis. In *Social Research Methods* (4th ed., pp. 564-589). Retrieved from https://www.academia.edu/35174091/Alan_Bryman_Social_Research_Methods_4th Edition_Oxford_University_Press_2012_

Bryman, A. (2012h). Quantitative data analysis. In *Social Research Methods* (4th ed., pp. 329-351). Retrieved from https://www.academia.edu/35174091/Alan_Bryman_Social_Research_Methods_4th_Edition_Oxford_University_Press_2012_

Bryman, A. (2012i). Sampling. In *Social Research Methods* (4th ed., pp. 183-209). Retrieved from https://www.academia.edu/35174091/Alan_Bryman_Social_Research_Methods_4th Edition_Oxford_University_Press_2012_

Bryman, A. (2012j). Social research strategies. In *Social Research Methods* (4th ed., pp. 19-42). Retrieved from https://www.academia.edu/35174091/Alan_Bryman_Social_Research_Methods_4th_Edition_Oxford_University_Press_2012_

Bryman, A., & Bell, E. (2011). The nature of qualitative research. In *Business Research Methods* (3rd ed., pp. 385-421). Retrieved from https://www.uwcentre.ac.cn/haut/wp-content/uploads/2018/11/Alan_Bryman_Emma_Bell_Business_Research_Methodsb-ok.cc.pdf

DeLone, W., & McLean, E. (2003). The DeLone and McLean Model of Information Systems Success: A Ten-Year Update. *Journal of Management Information Systems*, *19*(4), 9-30. doi: 10.1080/07421222.2003.11045748

Fink, L., Yogev, N., & Even, A. (2017). Business intelligence and organizational learning: An empirical investigation of value creation processes. *Information & Management, 54*, 38-56. doi:http://dx.doi.org/10.1016/j.im.2016.03.009

Gaardboe, R. (2018). *Kritiske succesfaktorer for Business Intelligence.* Aalborg Universitetsforlag. Aalborg Universitet. Det Humanistiske Fakultet. Ph.D.-Serien. Retrieved from https://doi.org/10.5278/vbn.phd.hum.00088

Gaardboe, R., & Svarre, T. (2018a). BI End-User Segments in the public Health Sector. *Lecture Notes in Computer Science (including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 11032,* 231–242. Retrieved from https://doi.org/10.1007/978-3-319-98349-3_18

Gaardboe, R., & Svarre, T. (2018b). BUSINESS INTELLIGENCE SUCCESS FACTORS: A LITERATURE REVIEW. *Journal of Information Technology Management XXIX,* (1), 1-15.

Gaardboe, R., Nyvang, T., & Sandalgaard, N. (2017a). Business Intelligence Success applied to Healthcare Information Systems. *Procedia Computer Science, 121*, 483-490.

Gaardboe, R., Sandalgaard, N., & Sudzina, F. (2017b). The importance of task compatibility for web-enabled Business Intelligence success in e-government. *Proceedings of the 19th International Conference on Information Integration and Web-based Applications & Services,* 353–357. Retrieved from https://doi.org/10.1145/3151759.3151782

Gillham, B. (2008). The Pros and Cons of Questionnaires. In *Developing a questionnaire* (2nd ed., pp. 1-15). Retrieved from https://books.google.dk/books?hl=en&lr=&id=EpKvAwAAQBAJ&oi=fnd&pg=PP1&dq=questionnaire&ots=A6HzKEWZQ8&sig=g4dHlOEnj4Ak-jk-FpBuhSYRa0w&redir_esc=y#v=onepage&q=questionnaire&f=false

Gluchowski, P., & Dinter, B., & Schieder, C. (2011). *Towards a Life Cycle Oriented Business Intelligence Success Model.* American Conference on Information Systems. Retrieved from https://www.researchgate.net/publication/334051779_Towards_a_Life_Cycle_Oriented_Business_Intelligence_Success_Model

Grubljesic, T., & Jaklic, J. (2015). Business Intelligence Acceptance: The Prominence of Organizational Factors. *Information Systems Management, 32*, 299-315. doi: 10.1080/10580530.2015.1080000

Hou, C. (2012). Examining the effect of user satisfaction on system usage and individual performance with business intelligence systems: An empirical study of Taiwan's electronics industry. *International Journal of Information Management, 32*, 560-573 https://doi.org/10.1016/j.dss.2019.113113

Inge, D. (1929). But What Is Success?. *The North American Review, 228*(3), 281-285. Retrieved from www.jstor.org/stable/25110832

Jooste, C., Biljon, V. J., & Mentz, J. (2013). Usability Evaluation Guidelines For Business Intelligence Applications. *Proceedings of the South African Institute for Computer Scientists and Information Technologists Conference,* 331–340. Retrieved from https://doi.org/10.1145/2513456.2513478

Kaiser, K., & Young, S. D. (2013). What is Value? In *The blue line imperative : What managing for value really means* (pp. 1-22). California, CA: Jossey Bass. Retrieved from https://ebookcentral.proquest.com/lib/aalborguniv-ebooks/detail.action?docID=1216290.

Kim, G. J. (2015). Introduction In *Human-Computer Interaction Fundamentals and Practice* (pp. 1-12). Taylor & Francis Group, LLC.

Leidecker, J., & Bruno, A. (1984). Identifying and using critical success factors. *Long Range Planning*, *17*(1), 23-32. doi: 10.1016/0024-6301(84)90163-8

Mackenzie, N., & Knipe, S. (2006). Research dilemmas: Paradigms, methods and methodology. *Issues in Educational Research, 16*(2), 193–205. Retrieved from http://www.iier.org.au/iier16/mackenzie.html

Mardiana, S., Tjakraatmadja, J. H., Aprianingsih, A. (2015). DeLone–McLean Information System Success Model Revisited: The Separation of Intention to Use - Use and the Integration of Technology Acceptance Models. *International Journal of Economics and Financial Issues, 5*(1), 172-182. Retrieved from https://doaj.org/article/2066e6bcfdaa4a65a3e1dc43ed35f1bf

Molensky, L., Ketter, W., Bloemhof, J., & van de Koppel, H. (2010). Business Intelligence gap analysis: A user, supplier and academic perspective. *Proceedings of the 12th International Conference on Electronic Commerce: Roadmap for the Future of Electronic Business (ICEC '10), Honolulu, USA,* 119-128. Retrieved from https://library.wur.nl/WebQuery/wurpubs/400671

Mudzana, T., & Maharaj, M. (2015). Measuring the success of business-intelligence systems in South Africa: An empirical investigation applying the DeLone and McLean Model. *South African Journal of Information Management, 17,* 1-7. doi:10.4102/sajim.v17i1.646.

Negash, S., & Gray, P. (2008). Business Intelligence. In *Handbook on Decision Support Systems 2 Variations* (pp. 175-193.). Berlin, Heidelberg: Springer-Verlag. Retrieved from: https://link-springer-com.zorac.aub.aau.dk/book/10.1007%2F978-3-540-48716-6

Olsen, D., & Bryant, P. (2011). Business Intelligence And Information Systems: Enhancing Student Knowledge In Database Courses. *Review Of Business Information Systems (RBIS), 16*(1), 1-14. doi: 10.19030/rbis.v16i1.6759

Olsen, H. (2003). Kvalitative analysestrategier og kvalitetssikring: Tendenser i engelsksproget og skandinavisk metodelitteratur. *Sociologisk Forskning, 40*(1), 68-103.

Petter, S., & McLean, E. R. (2009). A meta-analytic assessment of the DeLone and McLean IS success model: An examination of IS success at the individual level. *Information & Management, 46,* 159-166. doi:10.1016/j.im.2008.12.006

Preece, J., Rogers, Y., Sharp, H. (2015). *Interaction Design: beyond human-computer interaction (4th ed.*). United Kingdom, UK: John Wiley & Sons Ltd.

Ravasan, A. Z., & Savoji, S. R. (2014). An Investigation of BI Implementation Critical Success Factors in Iranian Context. *International Journal of Business Intelligence Research, 5*(3), 41-57. DOI: 10.4018/ijbir.2014070104

Robinson, O., C. (2013). Sampling in Interview-Based Qualitative Research: A Theoretical and Practical Guide. *Qualitative Research in Psychology, 11*(1), 25-41. https://doi-org.zorac.aub.aau.dk/10.1080/14780887.2013.801543

Rosenfeld, L., Morville, P., & Arango, J. (2015). *Information Architecture: For the Web and Beyond (4th ed.)*. California, US: O'Reilly Media, Inc. Retrieved from https://ebookcentral.proquest.com/lib/aalborguniv ebooks/reader.action?docID=4333758

Smith, P. J., Beatty, R., Hayes, C. C., Larson, A., Geddes, N, D., & Dorneich, M. C. (2012). Human-Centered Design of Decision-Support Systems. In J. A. Jacko (Ed.). *Human Computer Interaction Handbook: Fundamentals, Evolving Technologies, and Emerging Applications* (3rd ed., pp. 589-615). Retrived from https://books.google.dk/books?id=dVrRBQAAQBAJ&printsec=frontcover&hl=da#v=onepage&q&f=false

Sridhar, M. S. (1995). Understanding the user - why, what and how?. *Library Science with a slant to Documentation and Information Studies, 32*, 151-164. Retrieved from http://eprints.rclis.org/9304/

Svarre, T., & Gaardboe, R. (2018). Characterizing business intelligence tasks, use and users in the workplace. *Journal of Intelligence Studies in Business, 8* (3), 45-54. Retrieved from https://ojs.hh.se/index.php/JISIB/article/view/328

Tamm, T., Seddon, P., & Shanks, G. (2013). Pathways to Value From Business Analytics. *Thirty Fourth International Conference on Information Systems, Milan, IT,* 1-16.

Tracy, S. J. (2010). Qualitative Quality: Eight "Big-Tent" Criteria for Excellent Qualitative Research. *Qualitative Inquiry*, *16*(10), 837-851. doi:10.1177/1077800410383121