Research proposal:
Facilitating the Implementation of Self-Service Business Intelligence

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Abstract:
Business Intelligence (BI) is widely implemented and used by many organisations. In a traditional BI system, power users serve less experienced casual users. Power users analyse and gather data requested by casual users, and produce reports and visualisations that casual users base their decisions on. When data volumes and the usage frequency of a traditional BI system increase, power users have problems serving all the requests from casual users. The Self Service Business Intelligence (SSBI) approach can enable users to be more self-reliant and less dependent on power users. Although SSBI promises more benefits compared to a traditional BI system, many organisations fail to implement SSBI. This research proposal aims to facilitate the implementation of SSBI by suggesting recommendations for how to manage associated challenges when implementing SSBI. The proposed research method is a longitudinal study using multiple case studies. The expected results will describe how to implement SSBI on a desired maturity level while managing the associated challenges. The results consist of a framework that lists known associated challenges when implementing SSBI and a maturity model for SSBI, which defines the levels and characteristics needed for developing SSBI implementation. An expected contribution of this research is an increased adoption rate of SSBI.

Keywords: Business Intelligence, Self-Service Business Intelligence, Maturity models, Recommendations, Implementation
Table of contents

1. Introduction ......................................................................................................................... 1
  1.1. Problem Description ....................................................................................................... 2
  1.2. Aim and objectives ......................................................................................................... 4
  1.3. Contributions ............................................................................................................... 5

2. Background .......................................................................................................................... 6
  2.1. Business Intelligence ...................................................................................................... 6
  2.2. Self-Service Business Intelligence ................................................................................ 7
  2.3. Facilitate implementation .............................................................................................. 9
  2.4. BI Maturity Models ....................................................................................................... 9
  2.5. Challenges and recommendations .............................................................................. 11

3. Research approach .............................................................................................................. 12
  3.1. Philosophical paradigm ............................................................................................... 12
  3.2. Research Method ......................................................................................................... 12
  3.3. Selected cases ................................................................................................................ 13
  3.4. Data Collection ............................................................................................................ 14
  3.5. Data analysis ................................................................................................................ 15
  3.6. Research process ......................................................................................................... 16
  3.7. Research Plan .............................................................................................................. 18

4. Expected Results .................................................................................................................. 19

5. Publication ............................................................................................................................ 21

References ............................................................................................................................... 22

Figures and tables

Figure 1: Research process diagram ...................................................................................... 16

Table 1: Research plan ............................................................................................................. 18
1. Introduction

Today, Business Intelligence (BI) is widely used by many organisations, since it helps them make better decisions on time (LogiAnalytics, 2015; Imhoff and White, 2011). The BI collection of technologies and software is needed, because it enables organisations to be innovative, creative and competitive. In order to make better decisions, users need a solid foundation of data that is available and accessible at all times within the entire organisation, from strategic to operational levels. When casual users of a traditional BI system need to make decisions, they ask power users to create a report that visualizes and simplifies the process of making decisions. Power users interpret the request from casual users, combine the needed data, perform a customized analysis and then produce a report that visualizes the result. If the casual users want to view the report from a different angle, this request-respond process is repeated, making the entire procedure a time-consuming undertaking (Alpar and Schulz, 2016).

Since ever more data from internal and external sources is being stored in the data warehouse, and more users are applying the BI system, the request-response process between power and casual users is exerting much more stress on the IT department to deliver reports on time (Alpar and Schulz, 2016; Kabakchieva et al., 2013). The resulting bottleneck in the communication between power and casual users can therefore hinder time critical decisions without processing all the available data in the report. According to Imhoff and White (2011), many casual users in organisations make decisions that are not based on BI, due to the power users inability to deliver reports on time. Furthermore, due to cost-saving measures, many IT departments have been reduced, even though the number of casual users is increasing and the need for more access of BI and its available data is growing among the increasing number of casual users (Imhoff and White, 2011).

The self-service business intelligence (SSBI) approach is the result of the increase in available data and users of a BI system (Kabakchieva et al., 2013). The SSBI approach enables users to be more self-reliant. It allows all users to access data and to conduct their own analyses for decision-making, without the need to engage an IT department and their BI experts. Reports that could take months to deliver can now produced on the fly (Imhoff and White, 2011). The most compelling motivation for implementing SSBI is the increased flexibility it offers users, making them more self-reliant and thus improving the operational efficiency of organisations.
1.1. Problem Description

SSBI is considered to be the current and promising BI trend with long-term prospects (Kabakchieva et al., 2013). The focus is to empower casual users to use BI more easily and in a self-reliant manner (Alpar and Schulz, 2016; LogiAnalytics, 2015; Kabakchieva et al., 2013; Imhoff and White, 2011).

According to LogiAnalytics (2015) and their 2015 state of SSBI report, which is based on an online survey of more than 800 business and technology professionals, the traditional BI approaches are changing. Instead of focusing on supporting power users, organisations in general must be able to work more easily with data. According to 91% of the survey’s respondents, easy access to data without help from IT departments and power users is needed. In response to this demand, the new BI trend is Self-Service Business Intelligence (SSBI) (Kabakchieva et al., 2013). According to LogiAnalytics (2015), 95% of the respondents plan to invest in SSBI within the next two years. Several authors argue that organisations are willing to invest more on SSBI compared to previous years (LogiAnalytics, 2015; Imhoff and White, 2011; Svahn et al., 2017). Based on 281 respondents in Sweden, 58% are investing more on SSBI in year 2017 compared to 2016 (Svahn et al., 2017). According to (LogiAnalytics, 2015), 95% of their 800 respondents plan to invest in SSBI between year 2015 and 2017, which is an increase by 11% from previous report (LogiAnalytics, 2015).

Even though SSBI is a trend that existed for many years, it has not received its fullest breakthrough. The adoption rate of SSBI is still low and in practice, implementing SSBI is not as easy as expected (Alpar and Schulz, 2016; Stodder, 2015; LogiAnalytics, 2015; Kabakchieva et al., 2013). According to a survey of 234 respondents, conducted by Eckerson (2012), two thirds, (64%), of the 70% that are qualified BI professionals, rate their success with the SSBI approach as average or lower, while more than half (52%) of the newcomers rate their attempts at SSBI as fair or lower. According to LogiAnalytics (2015), only 22% of the respondents have access to data when needed (LogiAnalytics, 2015). Such results highlight the fact that in practice, implementing SSBI is not as easy as expected (Alpar and Schulz, 2016; Stodder, 2015; LogiAnalytics, 2015; Weber, 2013; Kabakchieva et al., 2013; Eckerson, 2012). The process to implement SSBI is difficult. Organisations struggle to implement SSBI and some authors (Johannessen and Fuglseth, 2016; Alpar and Schulz, 2016) argue that more detailed research on how organisations can implement SSBI is needed.

To support the implementation of traditional BI, different maturity models are available (Khue and Rehman, 2017; Chuah and Wong, 2011). The purpose of using a BI maturity model is to give a helping hand when measuring the current BI state and visualise the missing characteristics needed to implement BI to some ideal state (Khue and Rehman, 2017; Wixom and Watson, 2010). However, there is a missing gap in the literature since there is no maturity model available for SSBI. A major idea behind a maturity model is to define and set characteristics that are allowed to change over time and in a predictable way. It consists of different stages that incrementally increase depending on the organisational maturity of these characteristics. Different authors have developed a range of BI maturity models. However, most
of them do not consider all characteristics that affect BI (Khuen and Rehman, 2017). Most BI maturity models do not cover the entire area of BI and are often poorly documented (Hribar Rajterič, 2010). Instead, they focus on a specific point of view or a problem domain. Some focus on technical aspects while others are more business-oriented including management perspectives, organisational processes and people (Chuah and Wong, 2011; Hribar Rajterič, 2010). Other models that are more documented are still difficult to understand (Hribar Rajterič, 2010). Not covering all BI factors, poor documentations and difficulty to understand can leave the impression that the authors of the models have left important information out intentionally, just to enable the use of the models commercially (Hribar Rajterič, 2010).

TDWI, Gartner, Forrester, Hewlett-Packard, LOBI, BIDM and EBIM are considered the major existing and widely used BI maturity models available today (Khuen and Rehman, 2017; Chuah and Wong, 2011). However, they do not describe the characteristics needed to take full advantage of SSBI or how to actually implement SSBI. The BI maturity models that mention SSBI, or consists of characteristics that could be interpreted as SSBI-related exists during the final stages of the BI maturity model, which target the most advanced and experience BI implementations. The current literature lacks maturity models for SSBI and more research is needed to identify the characteristics to take advantage of the SSBI initiative. Therefore, this research will facilitate the implementation of SSBI by giving recommendations that manage associated challenges to achieve the desired maturity level of SSBI.
1.2 Aim and objectives

The overall aim of this research is to facilitate the implementation of SSBI by suggesting recommendations for how to manage the associated challenges when implementing SSBI. Given this aim, the following objectives have been specified:

O1. Identify associated challenges when implementing SSBI.

The first objective aims to identify the challenges that organisations are managing when implementing SSBI. The result is a framework that covers current challenges that exist when implementing SSBI.

O2. Develop a SSBI maturity model that includes the levels and characteristics of SSBI.

The second objective aims to develop the maturity levels and its characteristics needed to start the implementation of SSBI and to advance the SSBI implementation. The result is a SSBI maturity model that defines the levels and its characteristics needed to implement SSBI, ranging from newcomers to users aiming to achieve full benefits of SSBI.

O3. Identify recommendations needed to support the implementation of SSBI.

A synthesis of the result from objective 1 and 2 makes it possible to formulate recommendations that support organisations to achieve the desired maturity level of SSBI and to manage the associated implementation challenges.
1.3 Contributions
The result of this research contributes to both research and practice. From an organisational perspective, the result will support their preparation and planning needed to implement SSBI. The framework of challenges increases the awareness of potential pitfalls in order to achieve a desired maturity level of SSBI. SMEs or large organisations can use the framework differently, depending on their current BI maturity. Newcomers to SSBI will probably need to be aware of all challenges, while more experienced organisations only need parts. The importance is to increase the awareness of associated challenges and to avoid unnecessary negative surprises. The framework of challenges will contribute to research since there is no overview available for all associated challenges when implementing SSBI. Future research can evolve the framework when the adoption rate of SSBI increases and achieves a more mature breakthrough, similar to the evolved knowledge of the implementation of traditional BI. Implementation challenges of traditional BI decades ago are not the same as today.

A SSBI maturity model contributes to practice since organisation can identify their current SSBI maturity, similar to the available BI maturity models. It can be used as a roadmap that defines the characteristics needed to achieve their desired maturity level of SSBI. The contribution to research defines the different levels of SSBI and the needed characteristics.

The available definitions of SSBI in literature suit all implementations of SSBI, even though there is a difference implementing spread-sheets or self-service data preparation tools. Combining the definitions of SSBI and the SSBI maturity model will minimize the different understanding of SSBI and its characteristics needed. Both research and practice will increase the awareness of the different levels of SSBI and its characteristics to achieve a desired maturity level.

Different implementation challenges can be associated to different SSBI maturity levels. The recommendations of how to achieve a desired maturity level of SSBI will manage the associated challenges. This will increase the adaption of SSBI since organisations are more aware of the resources needed to implement SSBI. Since there are no scientific recommendations of how to implement SSBI, the contribution to research is valuable. It creates a foundation for further research to facilitate the implementation of SSBI even more.
2. Background
This chapter describes the theory related to the research aim and objectives. It involves the foundation for business intelligence and its related maturity models and how self-service business intelligence aims to improve business performance.

2.1. Business Intelligence
BI is widely used by many organisations even though there is no universal-accepted definition of BI (Wixom and Watson, 2010). There is a collection of different definitions of BI that fall into three main categories: BI as technology, product or as process (Lahramnn et al., 2010; Chee et al., 2009). BI as technology includes the tools and technologies to use, manipulate and analyse data. BI as product is the result achieved when data is analysed, like spreadsheets, dashboards and ad-hoc data queries. BI as process focus on how data is processed and transformed into action. Data is gathered and stored and then transformed into information by analysis. Information is the foundation for making decisions (Chee et al., 2009). Some definitions fall into one category while others span across more. Common definitions of BI only include technology or analytical front-end applications (Lahramnn et al., 2010; Chee et al., 2009).

The definition of BI in this research adhere to a broad scope and include all categories according to Chee et al. (2009) and goes inline with (Sulaiman et al., 2013; Wixom and Watson, 2010; Lahramnn et al., 2010; Foley and Guillemette, 2010). Traditional BI in this research is defined as an umbrella term that include technology, software applications, processes for retrieving and storing internal and external data, and to analyse data to help organisations make better decisions on time (Sulaiman et al., 2013; Wixom and Watson, 2010; Foley and Guillemette, 2010).

The heart of a BI is often considered a data warehouse that store all relevant internal and external data (Surajit et al., 2011). The sources of data vary in quality and format, and have different meanings, depending on their origin. Today, data has a finer granularity and is generated in much larger volumes than before. ETL-tools (Extract, Transform and Load) are normally employed to integrate this data and to make sure it is valid and useful for an organization. In addition, ETL-tools clean the data for storage in the data warehouse and prepare it for BI tasks. These processes refer to the back-end of a traditional BI system (Surajit et al., 2011). When data is available in the central data warehouse, different mid-tier servers are used for data analysis, which is the foundation of the decision reports used by decision makers. This process refers to the front-end of a traditional BI system (Surajit et al., 2011).

There are different groups of users according to the literature (Alpar and Schulz, 2016; Sulaiman et al., 2013; Hostmann, 2007). Based on how they interact with BI and decision-making these users are information consumers, analysts and specialists. Analysts and specialists are the defined as power users that have the ability and technical skills to select and use data, generate reports and analyse its
content. Their generated information is used by themselves or served to casual
users when making decisions (Alpar and Schulz, 2016; Sulaiman et al., 2013).
Operational staff, managers and executives normally belong to the information
consumers users that are defined as the casual users since they are not
considered any BI experts that have technological BI skills. They make decisions
that are based on information provided by BI experts. Casual users use
predefined reports or dashboards and they do not require any technological
knowledge compared to power users (Alpar and Schulz, 2016; Sulaiman et al.,
2013).

The request-response between power and casual users is a time-consuming
process (Alpar and Schulz, 2016). If casual users want to view data differently or
add components to view from another angle, power users must fulfil their
requirements and create a new report. Casual users that need to make time-
critical decisions and want to change the report have two options: wait and hope
for a new report in time or make decision without taking advantage of all
available data and options (Alpar and Schulz, 2016; Sulaiman et al., 2013). We all
know that guessing is not the strongest ingredient when making decisions.

When the organisation increases the frequency requests also increase. Power
users serving casual users are an increasing bottleneck that organisations have
to manage today. Self-service BI is the suggested solutions to deal with these
problems (Alpar and Schulz, 2016; Imhoff and White, 2011).

2.2 Self-Service Business Intelligence

The aim of SSBI is to set up a BI system that makes it possible for casual users to
make decision without help from power users. Casual users should be able to
access and query data, use predefined reports, analyse data or create their own
reports in order to make decisions on time. SSBI wants the casual users to be
more self-reliant and less dependent on the power user. Imhoff and White
(2011) define SSBI as: “The facilities within the BI environment that enable BI
users to become more self-reliant and less dependent on the IT organization. These
facilities focus on four main objectives: easier access to source data for reporting
and analysis, easier and improved support for data analysis features, faster
deployment options such as appliances and cloud computing, and simpler,
customizable, and collaborative end-user interfaces.” This definition of SSBI is
used in this research since it focuses on simplifying the process to use BI. To
achieve the aim of this research, to facilitate the implementation of SSBI, means
to fulfil the definition of SSBI, ranging from newcomers to organisations aiming
to achieve full benefits of SSBI.

Casual users shall become self-reliant and access data as desired without being
dependent on the IT department, while power users can accomplish their task
more quickly and efficiently (Alpar and Schulz, 2016). All users have different
demands and skills when using BI tools and if they have the appropriate skills
they do not have to wait for power users to prepare their request.
SSBI is presented in the literature as the future and a lasting trend that promises more benefits than traditional BI. Some benefits worth mentioning follow (Alpar and Schulz, 2016; LogiAnalytics, 2015; Imhoff and White, 2011):

- **Users conduct their own analysis:** Empowered casual users can access data more easily and with more self-reliance for the purpose of making decisions. Instead of asking power users for alternative reports, users can analyse data on their own.

- **Shift from reactive to proactive:** Stored data becomes old. Since SSBI facilitates the access of data, users can gain insight as soon as data arrives. Proactive decision-making can help organizations make decisions on time, which can increase market shares, cut costs, and aid expansions in many different ways, etc.

- **Relieve the pressure on the IT department:** More and more data is becoming available for decision-making. In a traditional BI system, power users support casual users by creating reports that are used for analysis and decision-making. If casual users want to analyse such reports from a different angle, they ask the power users to amend the report as desired. Since many users apply BI, a lot of pressure is put on the IT department and its power users. SSBI empowers casual users and enables them to perform this process on their own, thereby relieving the pressure on power users.

- **Eliminate guessing when making decisions:** Making decisions on time require a good foundation, such as a report or dashboard that visualizes the underlying data required for the decision. If casual users do not understand such a report and find analysing the data difficult, they normally have two options to choose from: request a new report from the power users or base the decision on guessing. SSBI eliminates guessing, since data can be included and amended as desired, without help from a power user.

- **Save resources:** Empowered casual users can perform their daily work more effectively, compared to working with traditional BI systems, which saves organizational resources.

According to Imhoff and White (2011)’s survey designed for business and technical executives within BI, 47% of their 587 respondents want to create their own reports without waiting for power users. To make better decisions, SSBI is a significant tool that improves the decision making process. But it requires that users have easy access to data at the right time and format and that it is easy to use and consume compared to traditional BI. Challenges to overcome in order for users to be more self-reliant is to make existing data flexible to retrieve and use, remove the difficulty of using multiple data sources and to enable multiple options to use and consume data differently, without need of help from power users (Alpar and Schulz, 2016). SSBI should be an environment that is easy to access, use and share data, information, reports and analysis (Alpar and Schulz,
2016; Imhoff and White, 2011). However, implementing SSBI is not as easy as expected (Alpar and Schulz, 2016; Stodder, 2015; LogiAnalytics, 2015; Weber, 2013; Kabakchieva et al., 2013; Eckerson, 2012). Several authors (Johannessen and Fuglseth, 2016; Alpar and Schulz, 2016) argue that more detailed research on how organizations can implement SSBI is needed.

2.3 Facilitate implementation
Research into supporting the implementation of SSBI is still limited. Some authors briefly describe tips and strategies how to get started with SSBI, but do not address how to facilitate the implementation of SSBI in detail (Weber, 2013; Imhoff and White, 2011). Eckerson (2012) describes recommendations for how to succeed with the SSBI implementation. However, these recommendations are rather general do not discuss associated challenges when implementing SSBI and do not describe in detail how to actually achieve a more matured implementation.

SSBI is the current trend in BI (Kabakchieva et al., 2013). The BI initiative has existed for many years and many organisations have already managed to implement BI (Wixom and Watson, 2010). To facilitate the implementation of traditional BI, many BI maturity models (BIMM) exist (Khuen and Rehman, 2017; Chuah and Wong, 2011). All of them have the same mission, to help organisations to evaluate their current maturity of BI and suggest how to move forward towards some ideal state (Khuen and Rehman, 2017; Wixom and Watson, 2010). Whereas maturity models are commonly used to facilitate the implementation of traditional BI, a maturity model for SSBI is currently missing. Therefore, this research will use the advantages of maturity models to facilitate the implementation of SSBI and aim at developing a maturity model for SSBI.

2.4 BI Maturity Models
A major concept of a maturity model is to define and set characteristics that are allowed to change over time and in a predictable way (Wixom and Watson, 2010; Hribar Rajterič, 2010). It consists of different stages that incrementally increase depending on the organisational maturity of these characteristics. For example, data access is one of many common characteristics that consist in different stages of BIMMs. Organisations need some solution to be able to handle a huge amount of data (Khuen and Rehman, 2017). BI can solve this problem differently. It is a difficult process to implement and it requires lots of resources. Existing BIMMs capture the current organisational BI state by identifying their strengths and weaknesses and visualise the missing characteristics to get full benefits of BI (Khuen and Rehman, 2017; Wixom and Watson, 2010).

Different authors have developed many BIMMs. Most of them do not consider all factors that affect BI (Khuen and Rehman, 2017). According to Chuah and Wong (2011) some BIMMs focus on technical aspects while others are more business oriented including management perspectives, organisational processes and people. It is difficult to achieve a holistic understanding of the BI maturity level since organisations must use multiple models (Khuen and Rehman, 2017).
Results between different maturity models are not comparable since they do not share the common levels and keys. At the same time, not all BIMMs are well defined and do not provide any guidelines of how to evaluate the maturity level or how to achieve the ideal state (Skyrius, 2015; Chuah and Wong, 2011). If BIMMs are supposed to be realistic, especially at their final stages, more criteria are needed on how to achieve the stage and what characteristics that are required (Skyrius, 2015).

Khuen and Rehman (2017) have addressed the problem of BIMMS that focus on different aspects, the difficulties to evaluate the current BI state and how to achieve the ideal state by developing a more comprehensive BIMM. It is called EBIM (Enterprise BI maturity model) and is supposed to be more comprehensive compared to existing BIMMs and also present a clearer way for organisations to move forwards towards their ideal BI state (Khuen and Rehman, 2017).

However, not any of the current, major and widely used BI maturity models: TDWI, Gartner, Forrester, Hewlett-Packard, LOBI, BIDM or EBIM include details about how to implement self-service BI (Khuen and Rehman, 2017; Howson and Duncan, 2015; Packard, 2011; Chuah and Wong, 2011; Sacu and Spruit, 2010; Packard, 2009; Evelson et al., 2009; Eckerson, 2006; Cates et al., 2005; Eckerson, 2004).

The closest mentioned details about SSBI exist in TDWI, Forrester and Hewlett-Packard’s BIMMs. TDWI mention that the last stages include solutions that speed up the delivery of information requirements. In combination with the BI usage stage where people uses BI tools more and more, these are requirements SSBI tries to meet. Thus, TDWI does not mention anything about SSBI (Eckerson, 2006; Eckerson, 2004). The only thing Forrester mention about SSBI is to measure the amount of requests that users can do on their own (Evelson et al., 2009). Hewlett-Packard’s mentions SSBI in the second stage where users should be able to take advantage of some SSBI capabilities. They should be able to customize some reports and analyse its content on a limited bases. At the last stage, users should be able to access information when needed and its content should be delivered in a way that seamlessly support their role in the organisation (Packard, 2011; Packard, 2009).

Unfortunately, none of the BIMMs mentioned above include any details regarding SSBI, what it means, how SSBI is defined or how organisations should implement SSBI.

Further research is required to address the missing gap of SSBI in existing literature and current BIMMs. To facilitate the implementation of SSBI is to create a distinct maturity model focusing entirely on SSBI, ranging from the first steps of data discovery to self-service data preparation. A clear maturity model targeting SSBI is one step closer towards facilitating the implementation of SSBI.
2.5 Challenges and recommendations

SSBI promises more benefits than traditional BI. Still, the existing literature on the field of SSBI is limited. Detailed discussions on how to implement SSBI are scarce. However, according to best practice reports, the interest in implementing SSBI is increasing (LogiAnalytics, 2015; Imhoff and White, 2011). Nonetheless, the progress of SSBI implementation is slow and problematic (Alpar and Schulz, 2016; Stodder, 2015; LogiAnalytics, 2015; Weber, 2013; Kabakchieva et al., 2013; Eckerson, 2012). For example, it is difficult to motivate organizations to implement SSBI and make the related cost investments when they have already made significant investments in traditional BI and have not achieved the desired results (Weber, 2013). To gain the motivation needed to make the change to SSBI, organizations must overcome the problems related to traditional BI. SSBI will improve issues experienced with traditional BI use. The first step is to identify the challenges associated when implementing SSBI. This will motivate organizations to better prepare the implementation of SSBI.

During spring of 2017, a literature review was conducted to identify the associated challenges when implementing SSBI, see chapter 5. The result of reviewing 21 papers identified 10 challenges within 2 main categories:

1. Access and use of data
   - Make data sources easy to access
   - Identify data selection criteria
   - Use correct data queries
   - Control of data integrity, security and distribution
   - Define policies for data management and data governance
   - Prepare data for visual analytics

2. Self-reliant users
   - Make BI tools easy to use
   - Make BI results easy to consume and enhance
   - Give the right tools to the right user
   - Educate users in how to select, interpret and analyse data for decision-making

Even though there are listed challenges, there is no literature that describes how to manage these challenges when implementing SSBI. Some limited recommendations and getting started tips exist in literature (Weber, 2013; Eckerson, 2012; Imhoff and White, 2011). They are however rather general and do not clearly manage associated challenges known in literature. Recommendations will be formulated in this research to manage the associated challenges when implementing SSBI, which clearly describe how to achieve a desired maturity level of SBBI.
3. Research approach
This chapter presents the philosophical paradigm, the research method and the project plan.

3.1 Philosophical paradigm
Information systems research is often associated with two main philosophical paradigms: positivism and interpretivism (Oates, 2006; Klein and Myers, 1999; Orlikowski and Baroudi, 1991). First, the positivist stance is based on the assumption that the world is ordered and regular and that the research works in some kind of laboratory setting where all affecting variables are controlled and the researcher is free of subjective bias and objectively observes the phenomena of interest. Positivist research primarily aims to prove or disprove a hypothesis. Secondly, interpretivism assumes that reality is relative and that multiple realities can be discerned (Oates, 2006). Consequently, it tries to identify, explore and explain how human beings interpret the same phenomena differently (Oates, 2006; Klein and Myers, 1999; Walsham, 1995; Orlikowski and Baroudi, 1991).

This research falls into the interpretivist paradigm, since it aims to gain understanding of how to improve the implementation of SSBI. The aim is not to test a hypothesis or investigate a phenomenon in a controlled setting. Therefore, the positivist paradigm is not appropriate for this research. Instead, the intent is to achieve a deeper understanding of a social phenomenon that is perceived differently by different users, which is characterised by the interpretive research paradigm (Oates, 2006; Klein and Myers, 1999; Walsham, 1995; Orlikowski and Baroudi, 1991).

3.2. Research Method
The research method for this research is a longitudinal study using multiple case studies (Oates, 2006; Walsham, 1995; Leonard-Barton, 1990). The strategy is to achieve a real-life, in-depth understanding on how different organisations implement SSBI. It includes understanding the achieved results and the decisions made how to implement SSBI, i.e. why the decisions were made and how they were implemented. This is the main motivation for choosing multiple case studies for this research.

Conducting case studies are suitable when trying to achieve a great insight and understand a phenomenon (Braa and Vidgen, 1999). A case study research strategy focuses on understanding an instance of a phenomenon in-depth using a variety of suitable data collection methods such as interviews, documents and observations (Pan and Tan, 2011; Oates, 2006; Carroll and Swatman, 2000; Eisenhardt, 1989). Therefore, case studies are considered to be an appropriate approach to fulfil the research objectives and overall aim.

An alternative research strategy that could have been useful is design science (DS), especially to fulfil objective 2 when developing a SSBI maturity model that includes the levels and characteristics of SSBI. Design science research focuses
primarily on the development of an artefact that solves a related problem (Papas et al., 2012; Oates, 2006). It is a problem-solving paradigm that focuses on the role of the artefact in an implementation process. DS pays however less attention to creating an in-depth understanding of the involved people, organisational practices and organisational context, compared to conducting case studies (Papas et al., 2012; Oates, 2006; Marshall and McKay, 2005). Even though a design science strategy could have been followed, the focus of this research is wider than only the development of a SSBI maturity model (objective 2). To arrive at meaningful challenges and recommendations (objective 1 and 3), in depth insight into the organisational practice of SSBI implementation is required, which can more suitable be obtained by conducting multiple case studies (Yin, 2013).

In this research, collection of user insights and experiences when implementing SSBI are important. Therefore, the selection of cases is also important. Choosing a single case has limitations in regards to generalizability and potential biases that mislead the result. Multiple cases guards against observer bias and supports external validity (Leonard-Barton, 1990). Only selecting an organisation that already has experienced SSBI implementation may provide a great story about the experiences, but the story may only prove useful to other organisations with similar BI skills and experiences. It will not be useful on a general level to a broader range of organisations. A better approach is to select multiple cases that can produces similar and contrary results by combining different experiences regarding the implementation of SSBI, ranging from newcomers to more experienced SSBI users.

### 3.3 Selected cases

The strategy when selecting cases is to achieve experiences from newcomers and experienced SSBI users. Therefore, 3 cases are selected, one consulting organisation that has experiences supporting other organisation with their SSBI implementation, one organisation that has implemented SSBI for many years, and one organisation that has recently started their implementation of SSBI. The combination of their experiences will provide results that fulfil the research aim and objectives.

This research project will conduct a longitudinal study using multiple cases that consists of 3 case studies that will be conducted in parallel for all research objectives during 3 years. They are descriptive studies that aim to achieve a rich and detailed analysis that relates to the research objectives within their context that is based on different user perceptions (Oates, 2006). All cases are conducted as a longitudinal study that are investigated over years to come, which will gain understanding that are continuous or change over time (Oates, 2006). The cases will also include a historical perspective to examine the past regarding the research aim and objectives. These are the selected cases for the research:

**Case #1, Advectas**: Is a consulting organisation that has worked with many organisations to support their implementation of SSBI. The selection of case #1 is considered a typical instance according to Oates (2006) since they have
experiences that can stand as representative of other organisations who want to implement SSBI. The case will achieve an in-depth understanding that is based on their customer projects where organisations have different skills and experiences implementing and using BI and SSBI. Advectas is a consulting organisation with 140 employees and over 200 customers that focus entirely on implementations of BI and SSBI. Project leaders, consultants, programmers and business developers within Advectas have experiences that relates to the research objectives.

Case #2, IF Skadeförsäkringar: Is chosen based on recommendations from Advectas who have been involved and supported their implementation of SSBI. They are considered one of the most experienced SSBI adopters and have achieved many benefits of SSBI compared to other organisations. This case is considered an extreme case that is not typical of others since their SSBI implementation is beyond what other organisations has managed today. The in-depth understanding from this case will gain insight that is useful for other organisations that want to implement SSBI.

Case #3, Skandia: They are newcomers to SSBI and have started to implement SSBI recently. They are preparing for their future SSBI implementation. The selection of this case is more of a test bed for theory that is identified in literature and within the other case studies.

These three cases combined will enable both breadth and depth in knowledge that will be relevant on a general level. Should any of the three cases not deliver the necessary output, two other organisations have stated a willingness to participate in the research. These organisations therefore work as a backup plan, in order to ensure the success of the research.

3.3 Data Collection

There are several data collection techniques when conducting case study research: interviews, observation, questionnaires and analysing documents (Pan and Tan, 2011; Oates, 2006; Carroll and Swatman, 2000). Since this research will identify in-depth experiences regarding implementation of SSBI, semi-structured interviews and document analysis are the chosen data collection strategies for this research. As the interview respondents have different backgrounds, experiences and skills, semi-structured interviews are appropriate for this research since the questions are allowed to change depending on the answers. Predefined questions that target respondents without any experiences relating to the questions will not yield any relevant information or any in-depth discussion. Instead, semi-structured interviews invite to follow up on questions that suit the respondents. In this case, an in-depth understanding can be achieved since questions can be guided to thoroughly identify answers to the research questions, independent on the background of the respondent. Unstructured interviews could be an option since it lets the respondents freely discuss about their experiences. However, semi-structured interviews are considered a better option since respondents can be interrupted if answers do
not relate to the research questions. It is not fruitful to interview respondents that discuss phenomena that do not relate to the research questions.

The chosen cases in the study have documentations regarding previous and future implementation of SSBI. Since these documentations will consist of experiences, they are fruitful to analyse in order to identify new theories regarding the implementation of SSBI, and to validate the findings from the interviews (Pan and Tan, 2011; Oates, 2006; Carroll and Swatman, 2000).

3.4 Data analysis
The appropriate technique for analysing interviews and documents are qualitative data analysis (Pan and Tan, 2011; Oates, 2006; Carroll and Swatman, 2000). Transcribed interviews and documents are in text format and suit the qualitative data analysis technique since the data is non-numeric. Quantitative data analysis is not the best option for this research since it focuses on numerical data when trying to find patterns and conclusions. Instead, the data in this research is major qualitative since interviews are transcribed into text and documents are available in text and images.

When all transcripts and document data are available, a content analysis coding process is performed (Pan and Tan, 2011; Oates, 2006; Carroll and Swatman, 2000). The theory related to the research objectives is used as themes when analysing the data. Therefore, the research approach is deductive since it uses the existing theories related to the research objectives (Oates, 2006). Data that belongs to a theme is coded and grouped. If data belongs to a theme that does not exists in previous theory, a new theme is created. The analysis is considered done when all data is coded and grouped to a themes (Oates, 2006). The aim with qualitative data analysis is to abstract data and patterns that are relevant to the research objectives (Pan and Tan, 2011; Oates, 2006; Carroll and Swatman, 2000).
3.5 Research process
This section illustrates the research process.

![Research process diagram](image)

Figure 1: Research process diagram

This research process is divided into the research objectives. Objective 1 starts by conducting a literature review that identifies associated challenges when implementing SSBI that currently exist in the literature. The identified challenges are used as themes when investigating more in-depth experiences in the case studies, aiming to create a deeper understanding of known challenges as well as identifying additional challenges. The result of the data collection and analysis is synthesized into a more comprehensive framework of challenges. The framework is the result of objective 1, which identifies the associated challenges when implementing SSBI.

The framework combined with a literature review is the foundation for objective 2. The strategy is to investigate how the organisations have managed the associated challenges when implementing SSBI. Based on their experiences, a SSBI maturity model is developed. The result is achieved once each maturity level and related characteristics are developed. Case #1 and #2, who are considered experienced SSBI users can give insight based on their previous
experiences when implementing SSBI. Case #3, who is newcomer to SSBI can enrich the maturity model by reasoning if the result is in line with their ongoing implementation of SSBI. The SSBI maturity model is the result of objective 2.

Objective 3 starts by combining the results from objective 1 and 2 and a complementary literature review. The aim is to understand how the associated challenges when implementing SSBI relate to each level of the SSBI maturity level. SSBI recommendations from literature are enriched and complemented by confronting the preliminary categorisations and descriptions with empirical experiences from the case studies. The strategy is to investigate what recommendations are needed to address each challenge to achieve a desired maturity level and its characteristic. A synthesis of the results makes it possible to formulate recommendations that support organisations to achieve the desired maturity level of SSBI and to manage the associated implementation challenges, which is the result of objective 3. These results will facilitate the implementation of SSBI, which is the aim of this research.
3.6 Research Plan
The overall plan of the research is presented in table 1 and covers all courses and research needed to answer the main research question. The plan stretches five years since my work is not full-time during the first two years.

Table 1: Research plan

<table>
<thead>
<tr>
<th>Activity</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
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</thead>
<tbody>
<tr>
<td>Courses</td>
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<tr>
<td>Literature study</td>
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<tr>
<td>Research question 1</td>
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<td>Research question 2</td>
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<td>Research question 3</td>
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<tr>
<td>Validate results</td>
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<tr>
<td>Publish results</td>
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<tr>
<td>Research proposal</td>
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<tr>
<td>Thesis proposal</td>
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<td>Final thesis</td>
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<tr>
<td>Ending seminar</td>
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</tbody>
</table>

All courses are planned to be finished mid 2019. The selection of courses will be adapted to suit the research project. The idea is to conduct the case studies without interruptions. The right mixture of courses and research is important since no full-time work is planned until 2019.

To keep up with the latest theories related to the research, literature study is conducted from start and until answers to the research questions has results. It is conducted in parallel during the project and is also a part of reading courses.

All the case studies will be conducted in parallel and shift focus once results for each research question is achieved. All results are validated with the involved cases and existing literature before mid 2020.

There are three main deadlines during the entire project. This report presents the research proposal that is done in December 2017. The research proposal seminar is planned to be held late December or beginning of January. The thesis proposal is planned to be finished in late 2019. Working with the thesis proposal is done in parallel starting in the second quarter of 2019. Writing the final thesis is planned for a year and the ending seminar is planned in December 2021.
4. Expected Results
The aim of this research is to facilitate the implementation of SSBI by suggesting recommendations for how to manage the associated challenges when implementing SSBI.

The result of this research will describe how to implement SSBI to a desired maturity level while managing the associated challenges. Facilitating the implementation of SSBI will increase the implementation rate of SSBI. The result includes guidelines that recommend how to overcome all identified challenges associated to each maturity level of SSBI, ranging from newcomers to organisations looking to take full advantage of SSBI. Organisations can use the result of this research to prepare for their journey implementing SSBI to their desired maturity level. The result will provide results that contribute to both research and practice. The expected results and its contribution are divided for each objective.

O1. Identify associated challenges when implementing SSBI.

The first objective aims to identify the associated challenges when implementing SSBI. The result consists of a framework that list all known associated challenges when implementing SSBI to its full potential. Newcomers to SSBI can use the result to be aware of the challenges and to prepare for their journey implementing SSBI. More experienced SSBI users that already have managed to overcome some challenges can use the framework when aiming to advance their SSBI implementation even more. To be aware of the associated challenges are a tool that support organisation to manage potential pitfalls, which increase the implementation rate of SSBI.

The result of the first objective will contribute to increase the body of knowledge of the existing implementation challenges of SSBI, which is a foundation for future research. SSBI aims to simplify the usage of BI, which is one branch in the BI initiative. The framework of challenges can support research in related BI branches that also aims to increase the usefulness of BI.

O2. Develop a SSBI maturity model that includes the levels and characteristics of SSBI

SSBI is not just an implementation of single software. Instead, it includes characteristics that range from newcomers to well-experienced SSBI users. The result of the second objective is a maturity model for SSBI. It defines the levels and characteristics needed to advance the SSBI implementation ranging from newcomers to those who want full advantages of SSBI. The SSBI maturity model will not include levels and characteristics that are available in the already existing BI maturity models. Instead, organisations can use the SSBI maturity model as a plugin for any of the existing maturity models of traditional BI. There
is no need to achieve a certain level of BI maturity to use the SSBI maturity model. Instead the SSBI maturity model is ranging from newcomers to organisations seeking to implement SSBI to its full potential, independently on their traditional BI maturity. Organisation can use the SSBI maturity model to understand the characteristics needed to achieve a desired maturity of SSBI. Awareness of the different levels and its characteristics support the preparation needed to start the implementation journey toward the desired level of SSBI. Since there is no maturity model focusing entirely on SSBI, the contribution to research is valuable. Other researchers can use the SSBI maturity model to prepare their future research of SSBI and increase the implementation rate even more.

03. Identify recommendations needed to support the implementation of SSBI.

The framework of challenges will be mapped into each level according to the SSBI maturity model. Once each challenge is associated to a certain level of the SSBI maturity model, guidelines can be provided that support organisations to achieve the desired maturity level and overcome the associated challenges. The result will support organisations to implement SSBI since they are more aware of the effort needed to achieve a desired maturity level of SSBI. Organisations are able to be more self-reliant and more prepared when implementing SSBI.
5. Publication


Abstract:
In a traditional Business Intelligence (BI) system, power users serve less experienced casual users. Power users analyse and gather data requested by casual users, and produce the reports and visualizations that casual users base their decisions on. When data volumes and the usage frequency of a traditional BI system increase, power users have problems serving all the requests from casual users. The Self-Service Business Intelligence (SSBI) approach can enable users to be more self-reliant and less dependent on power users. Although SSBI promises more benefits compared to a traditional BI system, many organizations fail to implement SSBI. The literature review presented in this paper discusses six SSBI challenges related to “Access and use of data” and four challenges related to “Self-reliant users”. Awareness of these ten challenges can help practitioners avoid common pitfalls, when implementing SSBI, as well as guide SSBI researchers in focusing on their future research efforts.
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