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**Abstract**

Business Intelligence (BI) is commonly used to get value from data. It does have several limitations, though: power users serving business users is a severe bottle neck. A new approach has recently emerged to solve this bottleneck and to make business users independent: Self-Service Business Intelligence (SSBI).

Research on SSBI is slowly emerging, but the adoption is still rather slow. There are several challenges to overcome during SSBI implementations, but all research focuses on the perspectives of the organization adopting SSBI and their employees. Consultants often play a large role in these implementations, but their challenges and strategies for overcoming them is yet to be researched.

To research this, a case study design is used with the single case of consultants at Deloitte, a global leader in Data & Analytics service provision, implementing SSBI. Interviews were conducted with consultants from Deloitte Switzerland and Deloitte the Netherlands. These were then analysed using Thematic Analysis. As a result, eight categories containing a total of 23 challenges and four categories containing a total of eight strategies to overcome those challenges were identified. These were discussed with existing literature and classified as to being specific to SSBI implementations, specific to broader information systems (IS) implementations, and general consulting.

The results found that consultants do not only face SSBI-specific challenges, but also IS and consulting challenges. Furthermore, they do not only use SSBI strategies, but also strategies from IS implementations and general consulting. Although based on past observations, knowing about these challenges and strategies can help increase the success rate of SSBI implementations, as well as increase the adoption in the future.

As such, the thesis introduced a new unit of analysis to the literature of SSBI implementations. As SSBI consultants face similar challenges and use similar strategies as other consultants, this research does not only shine light on the complexity of SSBI implementations, but also possibly enriches BI implementations and more general IS implementations. This does require future research to validate the findings.

Key words	Self-Service Business Intelligence, Business Intelligence, BI, SSBI, Consulting, Implementation, Challenges
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**UNIVERSITY  
OF TURKU**

Turku School of  
Economics

# **SELF-SERVICE BUSINESS INTELLIGENCE IMPLEMENTATION CHALLENGES:**

## **The Consultant Perspective**

Master's Thesis  
in International Master in Management of  
Information Technology (IMMIT)

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The originality of this thesis has been checked in accordance with the University of Turku quality assurance system using the Turnitin OriginalityCheck service.

## FOREWORD

This thesis marks my completion of the triple master program International Master in Management of Information Technology (IMMIT) at Aix-Marseille Université in France, Turun Yliopisto in Finland, and Tilburg University, the Netherlands. Living in four countries in two years has truly been life-enriching and enhancing, despite the pandemic.

Words cannot express my gratitude for the friends met, lessons learned, and personal growth I got to experience through both the good and bad experiences gained.

With that, this thesis also marks the end of 19 years of education. When you are in primary school, you know you will go to high school next. After high school, you can go get a bachelor's degree and after that, a master's. There is always the next step. For the first time in my life, I am not a student anymore. For the first time in my life, the next step is open. I am thankful because my education and experience have given me many wonderful opportunities to fill that open space.

There are many people whom I would like to thank, starting with my parents and family for always encouraging me and enabling me to take the next step. I'm grateful for my (international) friends and my (former) bands for never failing to make me smile, for all the memories that have been and will be made, and for the never-ending support.

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*"I think that one of these days... you're going to have to find out where you want to go. And then you've got to start going there. But immediately."*

J.D. Salinger (The Catcher in the Rye)

Rens van Eggelen

Zurich, Switzerland, June 2022

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# 1 INTRODUCTION

## 1.1 Background

Many organizations have more data than they know what to do with, in part because of that data being in its raw form (Zikopoulos et al., 2011). Business Intelligence (BI) helps organizations make sense of that data and make data-driven decisions, instead of relying on gutfeel (Bogza & Zaharie, 2008). Furthermore, Lennerholt and co-authors (2018) state that BI helps organizations in becoming or staying competitive and innovative.

Porter famously wrote about competitive advantage and how companies can pursue it (1980). In his generic strategies model, he argues that organizations can focus on differentiation, cost leadership, or focus, to gain an advantage over competitors (Porter, 1980). According to Davenport (2006), another option has become available: competing on analytics. Companies who use this strategy, so-called analytics competitors like Amazon know how to squeeze every drop of value out of the ever increasing amount of data to dominate competition (Davenport, 2006). Indeed, Peters and co-authors found a positive relationship between investments into BI and competitive advantage (2016).

In BI, business users are served by BI experts who perform analyses for them, but often there are not enough technical experts to serve all business users. Making data-driven decisions alone is not enough, the decisions also must be made on time (Imhoff & White, 2011). According to Sherman (2014), there is a shortage of skilled people in BI and analytics, which keeping businesses from getting value out of their value.

Self-Service Business Intelligence (SSBI) is a novel approach to reduce business users' dependency on the BI experts. It "allows casual users to access and use data as desired, enabling them to analyze data and make decisions without support from a technical BI specialist" (Lennerholt et al., 2021).

Like many IS implementations, (SS)BI implementations are highly complex. Despite its advantages, the adoption of SSBI is still rather slow and organizations and their users have several challenges to overcome during these implementation projects (Lennerholt et al., 2018; Lennerholt et al., 2019; Lennerholt et al., 2021). To manage this complexity, organizations often collaborate with consulting firms when implementing SSBI.

## 1.2 Problem Statement

Despite this collaboration, though, not every implementation project is successful; either because of not achieving the full benefits that SSBI has to offer, or because of a project failing altogether (Lennerholt et al., 2022). This makes BI implementations a popular research area, with the challenges, critical success factors, and even governance of being studied, often with a specific focus on SSBI. The problem, though, is that this research area is currently looking at only one half of the equation. All this research focuses on the client organization and their employees: Riggings and Klamm discuss data governance at large accounting firm (Riggings & Klamm, 2017), Lennerholt and co-authors wrote multiple papers on the challenges of SSBI, including a user perspective (2021), a data perspective, and implementations from the perspective of the organization that is implementing SSBI (2019), and Aminy and co-authors (2019) wrote about the critical success factors of SSBI implementations. Despite that, little is known about the challenges, critical success factors, and governance of the consulting firms and their consultants who guide and assist the organizations in their adoption projects. This is true for the wider field of IS implementations as well, with ERP implementations as a notable example. This is troublesome because of the big role that these consulting firms and their employees play in SSBI implementations, so by not taking them into account, we are missing a big piece of the puzzle of understanding the phenomenon of SSBI implementations.

## 1.3 Research Question

This thesis would like to introduce this unit of analysis to the research area of SSBI implementations. As such, it aims to answer this research questions and sub-question:

*What are the challenges that consultants face during a Self-Service Business Intelligence (SSBI) implementation?*

*What strategies do consultants employ to mitigate the challenges they face during Self-Service Business Intelligence (SSBI) implementations?*

To answer this question, a qualitative interpretivist case study was performed to build theory. The single case that will be researched is the case of Deloitte, a Big Four consulting firm, implementing SSBI in client organizations. Interviews were conducted with

Deloitte consultants, who are experts in SSBI implementations. It should be noted that that consultant shall mean a professional who consults on an SSBI implementation, no matter their grade. This is important to avoid confusion, as consultant is also the name of a rank within consulting firms. These interviews were then analyzed using Inductive Thematic Analysis to uncover the consultants' challenges in implementations. Observations of the author as a trainee consultant, an online forum where (SS)BI experts interact, as well as documentation on SSBI challenges from the perspective of the implementing party will be used for triangulation purposes.

To shed more light on this new unit of analysis, and based on the interviews (as is common in inductive thematic analysis (Gioia et al., 2012; Braun & Clarke, 2006), the sub-question was later added to expand on the first research question.

#### **1.4 Research Relevance**

The contributions of this paper are twofold. By answering this research question, this paper has both scientific relevance, as well as business relevance.

##### **1.4.1 Academic Relevance**

Academically, the thesis is relevant, because it introduces a previously unexplored unit of analysis to the literature on IS implementations. First, it shines a light on a new part of the complex phenomenon of SSBI implementations, focusing specifically on challenges – the need for which is pointed out by Lennerholt et al. (2022). SSBI is a relatively new and emerging field of research, so this study will add to it.

Next, SSBI can be seen as a subarea of BI, so insights into SSBI challenges might enrich the insights on BI implementations as well, potentially even enriching insights into broader enterprise system (ES) literature, like that on enterprise resource planning (ERP) or customer relationship management (CRM) systems.

By doing so, it opens the door for future research. As an example, knowing the challenges that consultants face during SSBI implementations allows future researchers to investigate whether these challenges might play a role in other implementations as well. Furthermore, future researchers can define Critical Success Factors (CSFs) as well as governance models, both from the consultant's perspective. All of this contributes to a deeper understanding of the phenomenon of SSBI implementations, possibly broader ES implementations, and consulting in general as well.

#### 1.4.2 Business Relevance

The thesis aims to be relevant for two business stakeholders: consulting firms and their client organizations. First, the value for consulting firms and their consultants seems clear. Having an overview of the challenges consulting firms have faced in the past, might help those organizations take them into account beforehand and to prepare for them. Example benefits include making more accurate effort estimations when planning engagements thanks to a clearer picture of the complexity of parts of the engagement. This reduces over-, or worse, underestimation. Another example could be reducing the required effort because of superior preparation. Challenges can hopefully be overcome, or at least have their impact reduced.

As a result of this, the client organization benefits. Logically, consulting firms and consultants who are better prepared for the challenges they can expect to face during projects will suffer fewer of the challenges' impacts, and the project will be better off for it. This makes the implementation for the client smoother, and potentially faster. Hopefully, the research will contribute to better adoption of SSBI and better success rates of SSBI implementations.

### 1.5 Thesis internship context

For his internship and thesis, this paper's author is working at Deloitte Consulting AG, the Swiss branch of Deloitte Consulting. He transferred there following an internship he did next to his studies at Deloitte Consulting BV, the Dutch member firm. In both member firms, he works on Business Intelligence. These two internships uniquely position him as he has an international professional network in both countries that he can use to collect data from through interviews. As the member firms are separate firms, interviewing them sequentially can be seen as a form of triangulation. Unfortunately, the author does not have the ability to interview the consultants' clients.

### 1.6 Outline

The structure for the rest of this thesis is as follows. First, chapter two features a literature review that introduces and summarizes the literature on business intelligence and self-service business intelligence, illustrating what has and has not yet been researched. It will go on to introduce the organization that is the source for the case study. Next, in chapter

three, the methodological choices are described, including the research strategy, data collection method and data analysis. The results of that analysis are described in the results chapter. The discussion will relate the findings to literature and is in chapter five, including a section on the limitations of the thesis. Finally, the sixth chapter will give the thesis' conclusions and suggest future research.

## **2 LITERATURE REVIEW**

The aim of this literature review is to introduce and describe the key concepts of Business Intelligence (BI) and the current trend of Self-Service Business Intelligence (SSBI), a subset of the larger concept of BI, as well as summarize the literature on these topics. Data is described as the foundation of BI, illustrating also why BI has become so very popular recently. The challenges that BI faces are used to introduce SSBI, a new approach that aims to solve these problems. SSBI implementation rates are still rather low because of challenges. While more and more light is being shed on these challenges, they focus mostly on two units of analyses: the organization and the employee. A third unit of analysis, that of the consultant who implements SSBI has not yet been researched, although they play a big role in the process. As such, that is the unit of analysis for this thesis.

### **2.1 Business Intelligence**

This chapter introduces and defines Business Intelligence (BI). It discusses the underlying technology that enables it and caused its growth by looking at the recent rise of big data. The role of consultants in BI is described, with a highlight on the implementation of BI. Such implementations are complicated endeavors that can potentially bring great benefits, but also comes with a set of great challenges. Furthermore, some of the technique's overall challenges and limitations will be discussed as a means of introducing the relatively new concept of Self-Service Business Intelligence (SSBI) that aims to answer these challenges and limitations – at least to an extent.

#### **2.1.1 Introduction to Business Intelligence**

Although it is often thought of as a novel concept, the term Business Intelligence was introduced in as early as 1989 by Howard Dresner, then an employee at Gartner Group (Dresner, 2007). The company, now simply called Gartner, defines Analytics and Business Intelligence as “umbrella term that includes the applications, infrastructure and tools, and best practices that enable access to and analysis of information to improve and optimize decisions and performance” (Power, 2007), as famously quoted in Business Intelligence literature (Gartner, n.d.; Wixom & Watson, 2010; Nedelcu, 2013; Larson & Chang, 2016). To paraphrase, Business Intelligence is about analysing data to get value out of it. This value does not have to be monetary.



### 2.1.2 The rise of BI

Although the concept is not new, its popularity has grown tremendously in the last years. Somewhat paradoxically, big data is a problem that empowered its own solution. It has been well-established that the storage of data nowadays is so cheap, that it barely makes sense to delete data anymore (Santry et al., 1999). Combine that with Butter's Law of Photonics that predicts that the cost of transmitting data over a network halves within 10 months and we can speak of a data explosion. In fact, in 2011 consultants from the prestigious professional services and research firm McKinsey found that on average, companies with 1000+ employees store over 230 TB of data (Brown et al., 2011). Imagine how high that number must be now, 11 years later.

In his 2021 lecture, Weigand describes that the amount of data was growing much faster than the ability to do something with said data; traditional methods of analyses were unable to process this amount of data. At the same time, there were technologies that had been existing for a while, but that needed more computing power and data to be viable. This data explosion thus powered these 'new' analytic technologies, like Artificial Intelligence (AI), Machine Learning (ML), and Business Intelligence.

#### 2.1.2.1 *Value of BI*

Although some researchers still question the value of BI systems, the overwhelming consensus is that BI does add value to organizations. The last 20 years, many researchers investigated the impact of BI; how that value can be unlocked (Trieu, 2016). Trieu (2016) summarized these impacts and came up with the following impacts: "improving operational efficiency by minimising mis-targeting customers, transforming business processes, enriching organizational intelligence, and developing new or improving products or services." These impacts, together with favourable business conditions, can cause an increase in organizational performance. Trieu summarizes five such conditions. The first is already having a competitive position. Next, favourable competitive dynamics, like competitors responding slow or not at all. Third, industry factors, because the industry in which an organization operates has a result on how BI is used and can contribute value. Non-service industry organizations often have a stronger relationship between organizational performance and BI impacts, for example. The fourth condition are country factors, like law, infrastructure, culture, where developing countries typically experience entry

barriers in applying BI. Finally, latency effects and competitive process, as it may take time for an organization to reap the benefits of the adoption of BI.

BI insights often come in the form of patterns. In order for these insights to be able useful, and to ultimately lead to these BI Impacts, several criteria have to be fulfilled (Kaur, 2005). These criteria are divided into objective and subjective measures. The objective measures are based on the statistical strength of the findings (Saghafi, 2021). The subjective measures are based on the human judgement of the person interpreting the pattern. Within the subjective measures, there are three sub-measures: novelty, and expectedness, and actionability. If something is not novel, then the user was already aware of it before BI pointed it out, meaning the BI output served as only a reminder. Similarly, if the pattern is expected, users do not need BI to point it out. Finally, if the pattern is both novel and unexpected, but the organization cannot do anything about it, value can still not be unlocked (Kaur, 2005).

The user must be made aware of these patterns. A popular way of doing so, is by visualizing them in dashboards. The value of presenting insights visually has been long established, as dashboards which like a car's dashboard, show all important information in a single view to allow for easy monitoring (Elias & Bezerianos, 2011). In BI dashboards, this takes the form of charts, graphs, tables, and other visual components. Already in 2010, Garner identified dashboards and BI as value drivers for organizations (Elias & Bezerianos, 2011).

#### *2.1.2.2 Data*

As such, it can be concluded that data itself holds value, but is not inherently valuable; it needs to be processed and analyzed to become valuable. This is often described with Ackoff's Data-Information-Knowledge-Wisdom (DIKW) hierarchy (Ackoff, 1989), also often called the wisdom hierarchy, knowledge pyramid, and information hierarchy (Rowley, 2007). It describes that the first level is data and its rawest form, properties of something that by themselves only represent single things. Information can then be inferred from data; a transformation into a usable format to describe things and answer questions about them, like who, what, when, where, etc. The next level, knowledge, is about putting that information into action, characterised by instructions, enabling how-to questions to be answered. The top of the pyramid is wisdom. At this level, one can speak about understanding – why-questions can be answered with wisdom. The higher one goes up the

DIKW hierarchy, in theory, the more value can be derived: rather than only being able to describe something, you understand why that thing is that way and how to influence it.

This relates strongly to the three stages of BI: descriptive analytics, predictive analytics, and prescriptive analytics (Lepeniotti et al., 2020). Descriptive analytics relates to the information layer. As the name suggests, it describes a phenomenon in the past or present. Predictive takes the analysis one step further by looking at the future and predicting what will happen to a phenomenon if one would not interfere. Finally, like wisdom in the DIKW hierarchy, prescriptive analysis advice on what steps to take next and why.

### 2.1.3 Recent research on BI

BI as a field is very much developing. Notable recent topics of BI literature include Industry 4.0, Internet of Things (IoT), and Process Mining (PM).

The first generation of industry, 1.0, is also referred to as the Industrial Revolution. It is characterised by mechanization and steam power. The 2<sup>nd</sup> generation came in the 1870s with the introduction of mass production, assembly lines, and electrical energy. Industry 3.0 came with automation, electronics, and computers. Recently, Industry 4.0 is up-and-coming. It is characterised by cyber-physical systems (Xu et al., 2018), IoT, Cloud Computing, and data and analytics (Tavera Romero et al., 2021). All the data that is being collected in the manufacturing process as well as usage data allow for innovations in asset utilization, quality, personalization, and forecasting accuracy (Bordeleau et al., 2020). SSBI plays a big role in enabling proper use of data-driven manufacturing according to Gröger (2018).

The Internet of Things (IoT) is a “system involving connected devices that gather data and connect with the internet” (Tunc, 2021; p. 3). Thanks to techniques like Cloud Computing, this data can be used as input for Business Intelligence (Lee & Lee, 2015). As the applications for IoT are broad, so are the use cases for BI based on IoT data, ranging from wearable health monitor data that healthcare providers can use to better influence patients as described by Lee and Lee (2015) to a smart home system that minimise energy consumption, as described by Al-Ali et al. (2017). The fourth layer of IoT is the user interface, where SSBI can be deployed to present the user with insights in a useful way (Tunc, 2021).

A research area that has been gaining a lot of traction recently is process mining, as coined by Van der Aalst (2000), often called the *Godfather of Process Mining*. Although Process Mining is now its own field, looking at the used definition of BI, one could argue

that PM falls under that umbrella as well. Specifically, to analyse information on processes optimize performance of processes. Furthermore, like BI, PM often uses dashboards to visualize insights, for example in this study where PM is used in the context of a hospital to track people and assets, enhance the flow of patients, among others (Martinez-Millana et al., 2019), often with a large self-service component. A lot of recent research on the topic focuses on just that: applying PM to new areas: Thiede and co-authors (2018) conclude that most research so far looks at PM in single organizations and that cross-organizational research is still missing now.

#### 2.1.4 The limitations of traditional BI

According to Sherman (2014), there is a shortage of skilled people in BI and analytics, while the BI process of combining and analysing data to unlock its value is difficult. Lennerholt et al. (2021) split BI's users into two groups: casual users and power users. Casual users are the users who do not possess the technical expertise to carry out the BI process itself, but who consume the output of BI in their work. As they cannot produce their own insights, they rely on the power users. Power users do have this technical expertise, which they can use to get to both the insights they require, as well as those requested by the casual users.

The number of casual users is growing with the amount of data, though. Alpar and Schulz (2016) note that power users cannot keep up with the growing number of casual users who depend on them. The problem with this is four-fold (Lennerholt et al. 2021): first, analyses are reactive as casual users have to request every specific analysis. Second, this increases decision time as casual users have to wait until the power users have time for their request, which may mean windows of opportunities get missed. Thirdly, in the worst cases, it can even lead to making decisions that are not based on data if the casual users cannot wait, or the power users cannot get to the request. Finally, all of this puts tremendous pressure on the IT department, who have other tasks besides BI as well. As such, Yu and co-authors (2013) argue that BI systems that are easier to use are required to combat these issues.

## 2.2 Self-Service Business Intelligence

This chapter will introduce SSBI. It will first define SSBI, then discuss the three levels in which it can be used, note both the benefits and challenges, introduce CSFs and implementations, and finally relate that to the topic of SSBI implementation challenges for consultants.

### 2.2.1 Defining Self-Service Business Intelligence

Self-Service Business Intelligence (SSBI) is a proposed answer to the aforementioned problems. As the name suggests, the premise of SSBI is to enable casual users to serve themselves and perform their own analysis instead of having to rely on the more technical power users. Like with BI, this paper will use the Gartner definition of SSBI: “end users designing and deploying their own reports and analyses within an approved and supported architecture and tools portfolio” (Gartner, n.d.).

### 2.2.2 Three levels of SSBI

Alpar and Schulz (2012) describe the three levels of self-service, which each require a different level of support. As such, the level of SSBI is not constant per user, it depends on their analytical skills (Alpar & Schulz, 2012). The three identified stages are: usage of information, creation of information, and creation of information resources.

In the first level, the user can access reports that have already been created. They will be able to filter and in some cases drill-down in the aggregate data to get to more detailed data. The difference from traditional reporting is that users have access to every report that may be relevant to them. This level works well for non-technical business users but is not very flexible.

At the second level, users can create their own reports; they have access to data to create their own virtual views; much more flexible. In traditional BI, this would be done with SQL, but that requires technical knowledge that casual users typically do not possess. In the advanced stages of this level, users can even perform advanced analytics like predictive analytics, rather than only descriptive analytics. To make sure that other users benefit from these analyses too, recommender systems, knowledge management, and other ways of sharing analyses within the organization can be used (Alpar et al., 2015; Imhoff & White, 2011). The drawback is that non-technical users might make mistakes in their analyses.

The final level allows users to connect new data that has not been pre-processed by IT and combine it with company data. Whilst providing ultimate flexibility, the risk of users not understanding the data properly is significant. In advanced cases, IT can create reusable components of data that users can drag-and-drop to combine.

### 2.2.3 SSBI Benefits

The obvious benefits are that it answers the aforementioned problems. When business users can perform their own analyses, that removes the request-relationship with IT to a large extent, meaning that analyses can be performed proactively instead of reactive. Allowing users to test hypotheses cheaply, without having to ask someone else that is, will allow more unexpected insights to be discovered in addition to the more expected hypotheses. Furthermore, users can conduct the analyses whenever the topic comes up. Not having to wait for someone else means that insights can come when they are still relevant. If the entry barrier to analysis is lower, one expects that more users will perform some analysis before taking a decision, leading to increased data-driven decision making. Finally, the technical users can focus on their actual roles instead of having to support casual users.

What may not be obvious at first glance, though, are other opportunities that SSBI offers to organizations that cannot implement traditional BI. As an example, McCabe (2012) found that small and medium-size enterprises (SMEs) are slow to adopt BI. This makes logical sense; projects to implement BI are huge and complex, and an organization that does not have many employees may not have the right technical expertise required of power users to serve casual users. A solution that requires less technical expertise and enables business users to perform their own analysis thus offers a big opportunity to SMEs (Raj et al., 2016).

### 2.2.4 SSBI Challenges

Of course, there are also risks to giving every user the ability to perform analysis, especially if they are not technically inclined, especially at the later stages of level two and beyond (Alpar & Schulz, 2016). There is a big risk of drawing incorrect conclusions as a result of looking at wrong data, incorrectly combining data (Lennerholt et al., 2018), or generally misinterpreting data. Famous examples of the latter are famous spurious correlations (Vigen, n.d.). These happen when data is correlated, but not causally related. In

the famous examples published by Vigen, it is clear that per capita consumption of mozzarella cheese are not related to the number of civil engineering doctorates aware, despite its correlation of 96% (unless civil engineering doctors are especially fond of mozzarella cheese and singlehandedly and statistically significantly influence the per capita consumption), but in business examples, it is not always as easy to see that a correlation is just spurious, which can easily lead to errors.

Another challenge relates to governance and security of data (Alpar & Schulz, 2016). This is important when adding data, especially when it originates outside of the organization. If aspects like who can add data, what kind of data can be added, how long that data is allowed to be stored for, et cetera is not defined, security breaches can occur as a result. At the same time though, these guidelines cannot be too restrictive either, as that would go against the idea of empowering the user with SSBI.

#### *2.2.4.1 SSBI Adoption*

Another challenge is that SSBI adoption is still rather slow. 2015 statistics by Logi Analytics showed that only 22% of casual users can actually make use of SSBI. Implementing SSBI is not as straightforward as giving a lot of users access to a lot of data either. As an example, proper governance is of major importance: who can add data, create new reports, et cetera. Eckerson (2008) describes a company whose users created a massive amount of 26,000 reports after only a few years of SSBI. As a result, they had to scale back down to 300 standard reports which covered most KPIs.

#### *2.2.5 SSBI Critical Success Factors*

Success rates in SSBI are still rather low (Eckerson, 2012), and challenges are increasingly being investigated, but critical success factors are still rather underdeveloped. Aminy and co-authors recently introduced critical success factors (CSFs) in hopes of advancing the success of SSBI implementations (2019), but delimited themselves to researching only organizations that have experience in traditional BI. Based on seven interviews with BI experts, they defined a conceptual model with two contexts (technological and organizational) and five critical success factors: managing SSBI users, business and IT cooperation, data governance based on maturity, data quality, and finally semantic layer strategy. More recently, Lennerholt et al. (2022) defined seven CSFs that seem to

overlap with the previously identified CSFs to a large extent, but with a broader focus on users.

### 2.2.6 SSBI Implementations

Before an organization can reap the benefits of SSBI, it first needs to be implemented. For such implementations, organizations often hire consulting firms, as is evident from the many papers about SSBI implementations using interviews with consultants (Lennerholt et al., 2018; Lennerholt et al., 2020; Lennerholt et al., 2022 as notable examples). Despite the benefits SSBI aims to offer, the implementation rate of SSBI is not high yet (Lennerholt et al., 2021; Logi Analytics, 2015). Lennerholt and co-authors (2021) argue that several challenges must be addressed for SSBI to work. These challenges differ at least partly from the challenges traditional BI implementations face, according to Lennerholt et al (2018).

In their most recent paper, Lennerholt and co-authors consolidate their previous research and come up with nine success factors to manage 37 challenges organized into the five categories of the AQUIRE framework: Access and use of data, data Quality, User Independence, Report creation, and Education (2022). The identified challenges can be seen in Table 1.

Most of the user-related challenges here are specific to SSBI as opposed to traditional BI, but some challenges are shared with traditional BI as well. This paper previously discussed how data is the foundation of traditional BI as well, thus challenges for data quality are very much applicable in that context too. In, e.g., process mining, the user-related challenges might play a lesser role, as the self-serving users are typically more technical by nature, as process analysts.

The challenges identified here relate strongly to the three levels of SSBI as defined by Alpar and Schulz (2016). One of the challenge categories, report creation, does not play a role in the first level of SSBI at all, as the creation of reports is considered to be level two or higher. The same goes for access and use of data; that becomes more of a problem as the organization progresses to higher levels of SSBI. It seems thus, that the higher level of SSBI an organization uses, the more challenges they face.

Clearly, the CSFs relate strongly to the challenges as well; both CSF models have a strong focus on data quality and the SSBI user. These are also good for half of the challenges of categories. The general SSBI challenges illustrate what can happen if the implementation challenges are not successfully overcome and no proper CSFs are in place:



low adoption of SSBI, an unsecure environment, and wrong decisions – if the project does not entirely fail, that is. On the other hand, the benefits of SSBI illustrate what can happen if the challenges *are* managed properly: a lower entry barrier to data-driven decision making when it is needed, proactive instead of reactive analytics, and independent users enabling a higher capacity IT-department. These are simultaneously the main shortcomings of traditional BI.

The research on the challenges of implementing SSBI and the factors that come with it as mentioned above focus on two main units of analysis: the organization and the employee. What has not been researched, are the challenges the consultants who implement these systems face. Perhaps, understanding these challenges might help consulting firms be more efficient in their implementations and help client organizations with a smoother implementation.

**Table 1: SSBI AQUIRE framework: Implementation Challenges**

Category	Section	Challenge
Access and Use of Data		<ol style="list-style-type: none"> <li>1. Difficult to access data</li> <li>2. Unaware of data sources</li> <li>3. Difficult to make data available</li> <li>4. Takes long time to request data access</li> <li>5. Multiple data sources in different environments</li> <li>6. Use correct data queries</li> <li>7. Control of data integrity, security, and distribution</li> <li>8. Policies for data management and governance</li> <li>9. Prepare data for visual analytics</li> </ol>
Data Quality		<ol style="list-style-type: none"> <li>10. Faulty data exists when making decisions</li> <li>11. Difficult to correct faulty data</li> <li>12. Difficult to determine right level of quality</li> <li>13. Difficult to define data</li> <li>14. Low awareness of using faulty data</li> </ol>
User Independence	Access and use data	<ol style="list-style-type: none"> <li>15. Difficult to know available data sources</li> <li>16. Difficult to locate data</li> <li>17. Difficult to use data</li> <li>18. Difficult to use many different data sources</li> <li>19. Support is required to add data</li> </ol>
	Low user skills	<ol style="list-style-type: none"> <li>20. Limited competence level</li> <li>21. Difficult to interpret report content</li> <li>22. Limited general IT skills</li> </ol>
	Difficult SSBI tools	<ol style="list-style-type: none"> <li>23. Difficult to use SSBI tools</li> <li>24. Users create isolated solutions</li> <li>25. Give the right tools to the right user</li> </ol>

Table continues on the next page

Category	Section	Challenge
Report Creation	Create and change content	1. Difficult to create SSBI reports 2. Requires lots of time and manual work 3. Difficult to change content
	Assure quality	4. Difficult to assure quality of reports 5. Redundant reports exist 6. No governance of SSBI reports 7. Unsupported tools are used
Education	No formal education	8. No formal educations are given 9. Users forget how to use SSBI 10. Not using SSBI after education
	Low interest in SSBI	11. Users do not see the benefits of SSBI 12. Users have different technical backgrounds

Adapted from Lennerholt et al. (2022)

### 2.2.7 Implementation Challenges: Consultant perspective

Implementation challenges are a popular research area. Generally, such papers focus on the challenges from the perspective of the implementing organization or the employees within that organization. Research into the implementation challenges from the perspective of consultants are rare. An example of a paper that does do that is Helo et al. (2008), who investigated enterprise resource planning (ERP) implementation challenges from the perspective of ERP vendors and consultants. Some examples of challenges that the authors found are communication challenges, challenges related to industries that consultants are not yet familiar with, challenges related to the limitations of the software itself. In addition, the authors also found challenges and disadvantages of ERP itself, like its cost and the dominating market position of vendors. These challenges do not seem to relate to the consultants themselves, though. Standardization is a common topic in ERP research, with a common discussion point being customize versus standardize (Soh et al., 2000). SSBI is by nature much more flexible, so it makes sense that consulting challenges for SSBI might be different from regular implementations.

Holmemo and co-authors (2016) investigate another type of implementation by consultants: that of the lean methodology. Although it is not IT consulting or a technical implementation, there may be some parallels to an SSBI implementation: consultants must implement a new way of working and help make the users independent in applying it. In the studied lean implementation, the consultants face difficulties with time limits, because the progress does not only depend on the consultant: the consultants do not just build a deliverable that they can hand-over, but the final project is an implemented technique and self-sufficient users. Another challenge that they found relates to consulting at large; experienced client-side employees may not accept instructions from consultants

who are typically much younger than them. This point is also touched upon by Bourgoin and Harvey (2018). Obviously, these two challenges are not enough to cover the entirety of SSBI implementations.

#### *2.2.7.1 SSBI Implementation Challenges for consultants*

With SSBI still being a relatively new topic in academia, there is currently no published research on the challenges consultants face when implementing (SS)BI yet. Even if the topic had been researched in the broader context of BI, the challenges SSBI consultants face may well differ. With the change from a BI tool's main user being technical power users to an SSBI tool's non-technical casual users, the dynamics of an implementation project change as well. Consultants no longer work with experienced technical clients, but with non-technical clients who typically don't have experience conducting analyses.

In an SSBI implementation project, consultants are in a rather unique position: like power users, they are the ones who initially implement the SSBI solution. They go through the available data, establish first data connections, perform the initial analyses, and build the first dashboards and reports. As consultants are typically new to the client organization, in other ways they are not like the power users, but more like the casual users. As an example, consultants will likely not know what data is available and where it is stored. Like casual users, they initially rely on power users to supply that information. The consultant can be seen as a third user type between the casual user and the power user, as such being highly interesting to study.

The researcher expects some of the challenges that consultants face in SSBI implementations to be general consulting challenges that come with the learning-credibility tension as described by Bourgoin and Harvey (2018). This tension describes the nature of consulting, where young professionals need deep knowledge of the client organization and their problems to deliver a project successfully – something they cannot have at the beginning of such a project. As such, consultants need to learn about the client, while also being perceived as competent. Hypothetically, and to take the previous example, a consultant may not know what data is available, but may be asked to design a report prior to having the full picture of which data is available.

### 2.3 Summary of the literature

To summarize, business intelligence (BI) aims to analyze information to make better decisions, leading to improved performance (Power, 2007). It is not a novel concept, but has been around since the 1980s (Dresner, 2007). Insights from BI often come in the form of patterns, which are usually shown in dashboards which, like a car's dashboard, show the most important information in a single view (Elias & Bezerianos, 2011). The foundation of BI is data, and with the recent explosion of data, BI has become ever-more popular (Weigand, 2021). BI does have its limitations, though. There is a shortage of skilled people (Sherman, 2014), and power users have to serve business users, which causes a bottleneck (Lennerholt et al., 2021). As such, a new approach where business users can serve themselves is gaining traction.

This new approach is called Self-Service Business Intelligence (SSBI), but the adoption is still rather low (Logi Analytics, 2015). Alpar & Schulz (2016) defined three levels of SSBI, each with an increase in self-service possibilities, which requires more of the organization (like user skills and support). The technique can bring many benefits (Lennerholt et al., 2021), but for those to be achieved, several implementation challenges and CSFs have to be achieved (Lennerholt et al., 2022, Aminy et al., 2019). It seems that the higher an organization is in terms of the levels of SSBI (Alpar & Schulz, 2016), the more implementation challenges they will face. If these challenges are not properly managed, the implementation could fail outright (Lennerholt et al., 2021), or lead to several SSBI challenges, like the risk of making wrong decisions and having an unsecure environment (Alpar & Schulz, 2016)

Usually, for SSBI implementations, like many information system (IS) implementations, client organizations hire consulting firms to assist them. Consultants thus play a large role in SSBI implementations. SSBI implementations challenges have not been studied from their perspective, though: the research above all focuses on the perspective of the organization adopting SSBI or the employees in that organization. Researching the consultant perspective and finding out what challenges they deal with sheds a new light on the complex phenomenon of SSBI implementations. Thanks to their large role, a better understanding may contribute to successful implementations and increased adoption. Furthermore, it introduces a new unit of analysis to the literature. As many aspects of BI and IS apply to SSBI as well, this research might enrich the insight into BI and IS implementations from a consultant's perspective as well, finding out shared challenges.

### 3 RESEARCH METHOD

This chapter will present the research methodology and choices that were made to get to it. It describes the research approach, strategy for data collection, describe the process of data analysis, and finally comment on the research quality.

#### 3.1 Research Approach

Mabry (2008: 214) defines case studies as “the empirical investigation of a specified or bounded phenomenon”. Case studies are often used research strategies in IS research, as pointed out by Galliers (1992). They are a versatile research approach, because of their flexibility, facilitating interpretivist, qualitative and quantitative methods, discovery and testing of theory, and single and multiple cases. As such, Cavaye (1996) argues that there are almost no research situations where a case study could not be used – provided that the type of case study fits the research context. This thesis will make use of a case study with the case being Deloitte implementing an SSBI system at a client organization.

Authors often merely state that a case study will be conducted, without explicitly specifying what kind of case study is being conducted, which can be confusing considering the approach’ flexibility and sheer number of options available (Cavaye, 1996). To prevent such confusion, this section will describe the nature of the case study that has been performed.

##### 3.1.1 Qualitative Interpretivist Case Study

The main goal of this paper is to develop the theory on challenges of SSBI implementations, the need for which is called out in Lennerholt et al. (2021). The focus is thus qualitative in attempting to understand the phenomenon, instead of trying to quantify or measure it. Cavaye (1996) notes that case studies are valuable in this context. This thesis aims to research the topic from the perspective of the consultants involved in SSBI implementations – thus context matters. The small quantity of prior research warrants a flexible approach for this thesis. There is a broad range of expectations of the data collection’s results and being able to zoom into any interesting novel aspects during the data collection as described by Mintzberg (1979) would help achieve this paper’s goal of exploring the relatively underexplored phenomenon. This is rather than a rigid predetermined structure that does not allow for this flexibility and thus possibly missing findings that would otherwise not come up. At the same time, there is overlap between this thesis’ topic and the

established research, enabling this case study to also validate the previous papers' results. Based on this reasoning, the more flexible, qualitative interpretivist epistemology was chosen over the more structured positivist method that disregards the context (Mabry, 2008).

### 3.1.2 Single Case Design

Case studies can be either single or multiple case, depending on the number of cases that are investigated. As discussed in the research context, the author is conducting his thesis internship at a consultancy firm. Considering the time constraints, the researcher is unable to reach out to other consultancy firm to interview them, and so the employing consulting firm will be the scope. To be able to collect as much data as possible, the case will be about Deloitte implementing SSBI in a general sense, rather than looking at a specific instance of implementation (a specific project). As such, no selection criteria will have to be placed on the project itself, making the pool of potential data subjects larger, and consultants can discuss challenges they faced in a variety of engagements on SSBI implementations, which helps getting a more complete picture of which challenges consultants face. After all, a consultant not facing a challenge in one specific project but facing it in all of their other projects does obviously not mean the challenge does not exist. The case will thus be a single case design.

## 3.2 Case introduction: Deloitte

Deloitte Touche Tohmatsu Limited, hereafter written as Deloitte to refer to the worldwide network of member firms and entities related to it, is one of the Big Four Professional Services Firms, further comprised of PwC, EY, and KPMG. Deloitte serves clients in the domains of Audit & Assurance, Consulting, Risk Advisory, Financial Advisory, Legal, and Tax.<sup>1</sup> They serve almost 90% of Fortune with Consulting taking up 40% of their entire business revenue of \$50.2B in Fiscal Year 2021 (Deloitte Global, 2021). In terms of revenue, PwC and Deloitte were alternating being the biggest of the four, until Deloitte decisively passed PwC in 2016 (Deloitte Touche Tohmatsu Limited, 2016; PricewaterhouseCoopers, 2016), making it the largest. It was already the biggest in terms of head-

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<sup>1</sup> These are the standard services, but local member firms may offer additional services, like Sustainability or Deloitte Private in Deloitte Switzerland.

count – almost 350K employees in FY21. The global network of member firms is headquartered in London, England, and has a presence in almost 150 countries and territories worldwide, having just separated their practice in Russia and Belarus following Russia's recent invasion of Ukraine (Deloitte & Renjen, 2022).

The firm was founded by William Welch Deloitte in 1845 in London and recently celebrated their 175 years of existence. It expanded to the United States of America in 1890 and has a rich history of mergers. Its most notable mergers include those with Haskins & Sells in 1972, Touche Ross in 1989, Arthur Anderson in 2002, and Strategy Consulting firm Monitor Group in 2013.

### 3.2.1 Deloitte Netherlands

Deloitte has been active in the Netherlands since a merger in 1992. After the biggest fusion in the history of the Netherlands in 2002, Deloitte became the largest Accounting and Consulting body in the country. The firm currently employs around 6000 people, operates out of 15 offices with headquarters in Amsterdam, and boasted a revenue of over €1B in FY21 (Deloitte Netherlands, n.d.).

### 3.2.2 Deloitte Switzerland

In Switzerland, Deloitte is headquartered in Zurich and employs over 2200 people operating out of 6 offices. It achieved a revenue of over CHF 506M in FY21. Deloitte AG is a daughter company of the UK member firm since 2006 (Deloitte Schweiz, 2021).

### 3.2.3 Global Leader as Data and Analytics Service Provider

Deloitte famously has a very strong BI capability, including SSBI. Gartner, the largest IT research and consulting company, is well-known for their Magic Quadrants in which they analyse companies and rank them according to their ability to execute and completeness of vision on certain topics. By plotting the results on axes, they classify which companies are the Niche Players, Visionaries, Challengers, and Leaders. In their Magic Quadrant for Data and Analytics Service Providers, most recently published in February of 2022, Deloitte has been classified as a Global Leader for the 8<sup>th</sup> consecutive year (Gartner et al., 2022; Deloitte & Zimmerman, 2022). The criteria used to evaluate the ability to execute,

and completeness of vision can be found in Table 2. The Analytics and Business Intelligence and Data Science and Machine Learning capabilities are especially important in the context of this thesis.

**Table 2: Gartner Magic Quadrant for D&A Service Providers Core Capabilities**

<b>Core Capability</b>	<b>Definition</b>
D&A Strategy and Operating Model Design	D&A strategy is an overall approach to how an organization expects to achieve its stated business vision through the strategic design and deployment of D&A initiatives
Data Management	Data management consists of the practices, architectural techniques and tools to describe, organize, integrate, share, govern and implement data
<b>Analytics and Business Intelligence (ABI)</b>	“ABI” is an umbrella term (encompassing diagnostic, descriptive, predictive and prescriptive analytics) that includes the applications, infrastructure and tools, augmentation, automation, and best practices that enable access to and context-enriched analysis of data to improve and optimize decisions and performance
<b>Data Science and Machine Learning (DSML)</b>	Data science and machine learning (DSML), or artificial intelligence (AI), applies advanced analysis and logic-based techniques. It includes machine learning (ML), augmentation, model management, data exploration and platform management to interpret events, support and automate decisions, and take actions
D&A Governance	D&A governance is the specification of decision rights and an accountability framework to ensure the appropriate behavior in the valuation, creation, consumption and control of data and analytics
D&A Program Management	D&A program management offers a mechanism for prioritizing projects and allocating resources within D&A initiatives. It includes the use of agile methods and XOps (data, ML, model and platform ops for AI) approaches that build, deploy and support D&A, as well as asset-based services
Enterprise Metadata Management	Enterprise metadata management is the business discipline for managing the metadata about the information assets of the organization. Metadata is information that describes various facets of an information asset to improve its usability throughout its life cycle

Note: adapted from Gartner, 2022

### 3.3 Data Collection

Van Maanen (1979) notes that one often thinks of personal contact with people that are part of the research context when one thinks about qualitative data collection methods. According to Cavaye (1996), conducting and then transcribing interviews is one of the main data collection methods in qualitative research. Interviews were also chosen as the main data collection method for this research.

For triangulation purposes, the interviews are supplemented with qualitative data from written documents, and the researcher’s observations as a trainee consultant working with SSBI implementations (data internal to the consulting firm). In addition to that, the data is triangulated with observations from professionals involved in SSBI implementations who share their experience, facilitated by Ingo Hilgenfort. Ingo Hilgenfort is a well-



respected expert in the Business Intelligence community with almost 20 years of experience at SAP – the largest ERP vendor in the world. He is not an implementation consultant, but works instead on the development of SAP’s SSBI tool. He has a popular educational YouTube channel, blog, and well-connected LinkedIn account that he uses to engage with other BI professionals. He recently uploaded a series of posts about self-service business intelligence (Hilgenfort, 2022a, 2022b, 2022c, 2022d) which, including the comments left by other professionals, are used for triangulation. The goal is to supplement, but not undermine the view of the interviewees to reduce the limitations of the single-case design of the study.

### 3.3.1 Interviews

A common theme in this thesis is the flexibility of the chosen methods to allow for the research to fit to the results. This theme comes back in the selection of the data collection methodology as well. Interviews allow interviewees to share anything they feel like sharing in the context of the case and the interviewer to ask follow-up questions if an unexpected answer is given, unlike surveys where subjects and depth of questions are dictated by the survey prior to it being sent out. This would offer only limited options for changing the survey, unless a researcher would conduct interviews before or after the survey to define questions or ask follow-up questions, or to send the survey in parts to have one part’s results influence the next part’s questions. Neither of these approaches were possible for this thesis due to time constraints.

The ground assumption for interviews is that the interviewees are so called “knowledgeable agents” – agents who know what they are doing and can explain those actions as well as the motivations of those actions (Gioia et al., 2012 :17. The researcher becomes a “glorified reporter” who accurately describes the interviewee’s knowledge. For the analyses, a further assumption is that the researcher themselves is also knowledgeable in that they can find patterns in the data, looking beyond what Gioia and co-authors call 1<sup>st</sup> Order concepts to identify 2<sup>nd</sup> Order themes.

In 1998, Perry published a paper detailing the case study method and specifically informing how honours, masters, and PhD theses should use the case study method with interviews. Regarding the interview structure, a two-part architecture is recommended for case studies using both inductive and deductive reasoning, like this one. The first part of the interview, Perry argues, should be unstructured, asking a “what is the story of your experiences of [topic]”-type of question – in this case: what is the story of challenges you

have experienced while implementing SSBI? This makes sure the first part of the interview is inductive and prevents a self-fulfilling prophecy of an interviewee talking about a topic because the interviewer brought it up in the question (Dick, 1990: 9). The intention is that the interviewee then brings up the topics by themselves. The second part of the interview then is more structured and can be used to ask prepared probe questions about the topics that did not come up, making sure they are “how” questions and not yes/no questions, so that the topics can still be researched.

### 3.3.2 Interviewees

Unfortunately, the researcher did not have the possibility to interview clients. Considering the research topic of SSBI implementation challenges from a consultant perspective, and the extensive research performed by Lennerholt et al. (2018, 2019, 2021, 2022) among others, interviewing only consultants and not their clients will suffice to achieve the research goals.

Within Deloitte, there are several teams who work on Business Intelligence. This study will focus on the Analytics teams within the SAP offering that resides in the Enterprise Technology & Performance Team in the Consulting Service Line. These teams are specialized in SAP Analytics Cloud (SAC), a Self-Service Business Intelligence tool (SAP, n.d.), but often also have experience with other SSBI tools. The reason for this boundary is threefold: first, this team is most specialized in SSBI implementations, so logically they have the biggest expertise. Secondly, this is the team that the thesis’ author worked for in both Switzerland as well as the Netherlands, so the largest part of the professionals available for interviews reside in these teams. Finally, a master thesis inherently brings time constraints that must be managed. Limiting the scope to only the main one of the multiple teams working on SSBI keeps the study feasible.

#### 3.3.2.1 Selection Criteria

Several selection criteria were kept in mind when selecting SSBI experts to interview, the main ones being years of experience with SSBI, and seniority within the firm.

- Years of experience with SSBI implementations: it is obvious that respondents need to have experience implementing SSBI to be considered experts on it. The more years of experience, the more projects a consultant has generally worked on, meaning they have a broader range of experiences that they can

share. A minimum of 1 year of experience is kept as a minimum baseline. It should be kept into account that large-scale commercial SSBI tools are relatively new. As an example, SAP Analytics Cloud (SAC), the tool that the team users, in its current form was released in 2017 (Rheinwerk Publishing, Inc., n.d.). Of course, the more years of experience, the better.

- Seniority in the firm: a consultant's current position within the firm often determines the nature of work that they perform within a BI implementation. While a consultant can be more operational, more senior roles like managers or directors tend to be more tactical or strategic. The goal is to have a representation from different levels to benefit from the different perspectives. In the Netherlands, working students and thesis interns are generally not staffed on implementation projects. As such, interviewees must be at least Business Analyst level.

In addition to those two main criteria, several other criteria were kept in mind as well. First, being familiar with multiple different SSBI tools was considered to be a pro, as it gives the respondents a wider perspective and it helps guarantee that the identified challenges are not challenges of one specific tool, but rather challenges of SSBI as a whole, independent of the specific tool. Furthermore, interviewees were asked about the number of implementations that they worked on, as that increases the likelihood consultants ran into challenges. Finally, consultants with different industry-expertise were selected, with most consultants having more than one main industry. This helps in identifying both potential industry-specific challenges, as well as general SSBI implementation challenges.

### *3.3.2.2 Respondents*

The respondents consist of five interviewees, as seen in Table 3. Although the number of respondents is small, they is varied. The represented levels range from Business Analyst, the first accepted level according to the selection criteria, to Director, which is the highest level of SSBI-experts satisfying the selection criteria in both Deloitte NL and Deloitte CH. The project roles covered are designing consultant, team manager, architect, all-round implementation consultant, project manager, team lead, program lead, subject matter expert (SME), and delivery lead. As such, both the operational as well as the more strategic perspective are covered, with the senior manager and director being especially strategic. The years of experience vary from 2 years to 22 years in BI. It should be noted that the \* indicates experience in BI rather than SSBI specifically, but that each

of those respondents mentioned that SSBI has always been a topic in BI. Furthermore, the interviewees represent a large section of the different industries that Deloitte serves. All subjects have used more than one SSBI tool. The respondents are from both Switzerland as well as the Netherlands. During the data collection process, the researcher found that despite the low number of respondents, there was a relatively high level of saturation. Due to time constraints, the researcher was unable to conduct a sixth interview.

**Table 3: Overview of interviewees**

Position	Country	Years of SSBI Experience	Number of SSBI Implemented	Industry	SSBI Tools Used	Date	Channel
Business Analyst	CH	2	5	Oil and Gas	2	12.05. 2022	Physical
Manager	CH	8	6	Insurance, Retail, Heavy Industry	4	14.05. 2022	MS Teams
Senior Manager	CH	17*	3-4	Life Sciences, Telecom, Industrial Products	6	16.05. 2022	MS Teams
Director	CH	BI: 22, SSBI: 12	10	Consumer, Banking, Public Sector	5	16.05. 2022	MS Teams
Manager	NL	13*	10	Energy, Retail	4	16.05. 2022	MS Teams

### 3.3.2.3 Note on anonymity

This study will not refer to its respondents by their names, but rather by pseudonyms consisting of their level and country. The first consultant in Table 3 will thus be Business Analyst CH or BACH for short. The goal is for the consultants to feel it is safe to share their opinions without hindrance and without filtering themselves knowing that whatever they say will be published with their name next to it.

After the interviews, the interviewees were asked if they wanted to review the transcriptions, giving them a chance to review and possibly provide feedback. While the respondents can give feedback and redact sensitive data, they do not have veto rights. Since there is no requirement to add the transcriptions to the appendices and all of the steps that were taken with the data are adequately described, the transcriptions are not included in the thesis to protect the interviewees. As Gioia and co-authors describe in their 2012 paper: the researcher cannot promise confidentiality as that would disable most reporting, but we can promise anonymity.

### 3.3.3 Interview Structure

The researcher aimed to conduct between 5 and 7 interviews depending on availability, time, and validity of the first interviews. An interview guide was developed, see Appendix 1, to standardize the structure of the interviews and to make sure that no topics would be forgotten. All interviews were recorded with a Otto.ai as well as Microsoft Teams, even if the interview took place physically. This was done for their transcription capabilities.

The first part of the interview consisted of definitions to make sure that interviewer and interviewee were on the same page. First, SSBI was defined as per the definition Lennerholt and co-authors (2021) as “SSBI allows casual users to access and use data as desired, enabling them to analyze data and make decisions without support from a technical BI specialist” and Imhoff & White (2011) “The facilities within the BI environment that enables BI users to become more self-reliant and less dependent of the IT organization”. The three levels of SSBI as described by Alpar and Schulz (2016) were mentioned as well. The reason for this is that not all business practitioners may be aware of the academic definitions of SSBI: Alpar and Schulz (2016) define the first level of SSBI to be Usage of Information, while the consultants might think that only levels two and three, Creation of Information and Creation of Information Resources, are considered to be SSBI. Furthermore, in consulting, a consultant can be both a rank as well as a function. Therefore, the interviewer clarified that consultant in this context refers to a professional who consults on an SSBI implementation, irrespective of their rank within the consulting firm. Finally, to avoid confusion about the phases of implementation projects, the interviewer clarified that implementation here refers to the full implementation project from design until hyper care after deployment.

After the interviewees were given a chance to ask questions about and comment on the definitions used, the interview started with asking the data subjects the contextual questions used to populate Table 3. After this, the ‘real’ interview started with an inductive open question structured as proposed by Perry (1998): “What is the story of your experiences implementing SSBI as a consultant?” If interviewees did not bring up any challenges, this question would be followed by “What are the challenges you have experienced as a consultant during SSBI implementations?”. If they did bring up challenges, open-ended follow-up questions would be asked to deep dive into them.

Furthermore, a list of potential topics to enquire about was made in case the interviewee would not continue talking by themselves. This list of topics was drafted based

on previous literature, suggestions from SSBI blogs, as well as the author's personal experience as a trainee in SSBI consulting. It should be noted that these topics were enquired about using how-to questions, to prevent putting words in the interviewee's mouths and making them identify a topic as a challenge purely because it was asked about.

To capitalize on the flexibility that interviews allow, each interview was analysed prior to the next interview so that topics that came up could be added to the list of topics to be asked to future interviewees.

To conclude the interview, the interviewees were asked if they had wanted to share anything else, whether they could think of any other challenges, and whether they had any feedback on the interview, questions, or definitions. After that, they were of course thanked for their time and input and given the opportunity to receive the transcript of their interview to reread and possibly provide feedback on.

All things included, each interview lasted approximately one hour, with some exceptions due to time constraints of the interviewees – the interview with Director CH lasted approximately 40 minutes.

### **3.4 Data Analysis**

The data, the transcripts from the interviews, are qualitative. Therefore, a qualitative analysis method should be deployed. Qualitative approaches are complex because of their nuance and diversity (Holloway & Todres, 2003), so careful attention must be paid to method selection. This thesis has chosen thematic analysis (Braun & Clarke, 2006) as its data analysis method.

#### **3.4.1 Thematic Analysis**

Braun and Clarke (2006) famously wrote about thematic analyses – a technique they saw widely used, but rarely acknowledged and poorly demarcated. They outlined the approach and provide a guideline on how to perform the analysis in an explicit and well-structured way. Braun and Clarke argue that TA underpins other qualitative techniques in that it teaches the core skills required for them. As such, they argue, it should be the first qualitative research method one should learn, especially considering its accessibility to those early in their qualitative academic journey, as deep technical knowledge of approaches is not required. These statements all fit the author of this thesis.

Thematic analysis has no one unified definition: Boyatzis (1998) and Attride-Stirling (2001) are a subset of several notable examples. This thesis will stick to Braun and Clarke's definition based on both the nature of the research as well as the accessibility of the definition: first, the other definitions implicitly tend towards positivism, while this thesis is interpretivist. Secondly while others may be more detailed, they are not as suited for a researcher unfamiliar with qualitative techniques.

This thesis will thus consider thematic analysis' aims to find, analyse, and report themes in data. It should be noted that the "find" here is active – rather than themes being inherent to the data. The researcher plays an active role in finding them and determining what are and what are not themes, there are no strict quantitative measures to determine this. This is one of the several points Braun and Clarke make regarding the transparency of the research – they argue that especially in thematic analysis, choices are too often not made explicit. Considering the flexible nature of thematic analysis, this is problematic, as it can inhibit the repeatability of the research and plays into the criticism by Antaki et al. (2002) of an 'anything goes'-attitude. To make sure this paper does not fall into that category, the author would like to reiterate the interpretivist nature of the thesis – a flexible approach that the flexible nature of TA supports.

#### *3.4.1.1 Themes*

Themes then "captures something important about the data in relation to the research question and represents some level of patterned response or meaning within the data set" (Braun & Clarke, 2006: 82). The question of whether something is or is not a theme is a matter of prevalence: what size a theme needs to be and how often should it be present in the data corpus – at what level of the data corpus. There is no set rule to determine this – this is not quantitative research. As prevalence is no key aspect of this study, the most straightforward definition of prevalence will be used: that at the level of the data item. That means at the level of each individual interview in this context.

One can conduct thematic analysis in a data-first inductive way, or a theory-driven theoretical way, depending on the goals of the analysis. In their methodology, Gioia and co-authors (2012) argue for what can be described as a combination of both techniques with two rounds of analysis. As interviewees are knowledgeable agents, they argue, the first order analysis should be close to informant terms to give them extraordinary voice. During this step, the focus is on the analysis of each individual interview, not on forming categories of themes across all interviews. As a result, the number of themes tends to

explode in this phase. This analysis can be seen as inductive per the data-driven description.

The second round of analysis is about the search for similarities and differences between all these 1<sup>st</sup> order themes. This stage is more researcher focussed, where they are forced to think across multiple levels: that of the informant terms, as well as the theoretical aspect to the themes. It can thus be seen as a more theory-driven analysis. This process reduces the number of themes that finally get distilled into aggregate dimensions – the final themes.

### 3.4.2 Expanding the Research Question

During the interviews, the consultants shared which challenges they experienced during SSBI implementations, but often also mentioned what strategies they deployed to mitigate these challenges, despite this not being explicitly asked. As the aim of this research is to shed light on the consultant perspective as a new unit of analysis, the researcher felt compelled to include those findings in the thesis as well. As such, the sub research question of “*What strategies do consultants employ to mitigate the challenges they face during Self-Service Business Intelligence (SSBI) implementations?*” was added to accommodate the inclusion of these results. The process of changing or adding research questions during the writing of the thesis is relatively common in theory building qualitative research (Gioia et al., 2012) and in inductive thematic analysis especially (Braun & Clarke, 2006). However, as the focus was only expanded towards the end of the thesis project, the researcher did not have enough time to review the literature on this aspect of the topic sufficiently.

### 3.4.3 Analysis

Braun and Clarke (2006) provide a set of six phases of thematic analysis, which this thesis follows. The first step is to familiarise oneself with the data. The researcher familiarized themselves by correcting the transcriptions of the data. As the description of the interviews was done by algorithms and none of the interviewees nor the interviewer speak English as their first language, it was important for the researcher to correct these transcriptions. This was done in three rounds per interview to really get familiar with the data, as recommended by Braun and Clarke (2006) when one does not transcribe the data them-



selves. The first round consisted of listening to the interview and correcting the transcription, then listening to the interview and checking the corrected transcription, and finally reading the transcription and taking notes (a good idea according to Braun and Clarke) without hearing the recording, to make sure that the written version without verbal context still make sense. It should be noted that the transcriptions were done word-for-word, instead of summarizing the essence of a statement. I.e., if an interviewee starts their sentence three times, each of those times are included in the transcription. This is important, as these subtleties can change the meaning of what was said (Poland, 2002). Unfortunately, sometimes the recordings or remote meeting software had a glitch causing a word or group of words to be unintelligible from the recording. In those cases, the label [unintelligible] was used. Finally, the transcriptions were sent to the interviewees.

Second, the initial codes were generated. This was done data-centrally, as per Gioia and co-authors' (2012) suggestion, but still focussing on those aspects related to the challenges and strategies to overcome them. Challenges were highlighted and split from the statements regarding how the interviewee dealt with such challenges. As Gioia and co-authors predicted, the number of initial codes exploded and were overwhelming: 57 challenge codes and 26 strategy codes were identified out of the 5 interviews. The researcher attempted to maintain the context of the extract by keeping some of the surrounding data (Bryman, 2001), but recognized the interviewees gave many different examples in their answers, so some context had to be filtered to keep the overall size manageable. A special eye was kept on keeping potentially contradicting data in the codes and extracts, the importance of which is argued in Braun and Clarke (2006).

Next, the codes were looked at from both the data levels as well as an academic view to find similarities between the different codes. As a result, 10 main challenges and 7 main strategies of overcoming those challenges were defined by the researcher. For transparency's and reproducibility's sake, it should be highlighted here that the researcher played an active role in the definition of the main challenges, as is always the case in thematic analysis.

After, the first order codes in those themes were compared to each other to find similarities and codes that were worded differently but described the same phenomena. They were triangulated with observations from an expert in the field of (SS)BI that were published on his blog as well as the author's personal observations as a trainee SSBI consultant.

During the writing of the report, the codes and themes were investigated in relation to each other and the original dataset. This brought the number of codes down to 23 and 8 for challenges and strategies respectively. Next, they were arranged in a way that makes both academic as well as narrative sense, structuring the challenges in the order that they would come up during a consulting engagement. The observations were triangulated with the data as described in section 3.2 Data Collection, as pointed out in the results.

### **3.5 Research Quality**

Cavaye (1996: 232) comments on the quality of interpretivist studies: “good interpretation is logically consistent, subjective, and adequate”. This researcher has worked to check all three boxes. The researcher found no logical errors and did not receive any feedback suggesting otherwise after a quick check by his supervisor. The subjectivity of the thesis was maintained by offering interviewees the chance to review and comment on the interviews and analyses. Finally, the researcher demonstrates adequacy by discussing the (triangulated) findings in Chapter 4 and relating it to established research in Chapter 5. In this capacity, the researcher also carefully commented on and sought rationale in seemingly contradicting observations by the consultants in section 5.1.1.2.

In addition, the researcher has also checked the 15-point checklist of thematic analysis as proposed by Braun & Clarke (2006: 96). In terms of the overall process, Braun and Clarke warn against not spending enough time on any phase of the analysis and “giving it a once-over-lightly”. As will be discussed in the discussion, the researcher had to deal with severe time constraints. Yet he focused on iteratively came to the current analysis, making sure nothing was looked at but once, despite the time constraints.

## 4 RESULTS

This section will discuss the results of the analysis, highlight interesting aspects of the interviews, and introduce the consultant's challenges as well as their strategies for overcoming those challenges. As one of the ground assumptions of the methodology is that interviewees are "knowledgeable agents", attention has been paid to give them exceptional voice in the results of this research.

### 4.1 A consultant's story of implementing SSBI

Right at the beginning of the interviews, when the consultants are asked to describe their story of implementing SSBI, almost all mention it being a good story (DCH: 22; MCH: 20). MNL summarizes it well:

*"I would summarize it as positive one, as good story I think I have been able to, to help [...] I have seen how this performance has improved with the use of these tools. But it hasn't been easy because it's difficult journey. These projects have been quite cumbersome and quite demanding in terms of effort in several dimensions"* (MNL: 16).

The consultants were also rather unanimous in their opinion that there are different levels of self-service and that each client might require a different level, depending on several factors:

*"if you bring to one client, a nice Mercedes, it's not good enough because they are expecting the Ferrari. If you are bringing Volkswagen Passat to another client that's more than enough because they were using a Cinquecento"* (SMCH: 37).

### 4.2 Challenges

Based on the interviews, eight main categories of challenges were defined, with a total of 23 challenges as summarized in Table 4. This chapter will detail each of the identified challenges by discussing what the consultants described and why that makes the aspect so challenging. They are presented in the same order as a consultant would typically encounter them during a project as good as possible, as these challenges can of course come up simultaneously and the consulting engagement is not a strictly, simply linear endeavour, but rather a complex engagement with many things happening in parallel.

Challenges in categories are formulated as present participles, as they answer the question: what is a challenge for a consultant? E.g., gathering requirements is challenging.

**Table 4: SSBI Implementation Challenges for Consultants**

Category	Challenge
Adapting to new situations	1. Adapting to new organizations 2. Adapting to new industries 3. Keeping up with the steep learning curve
Project Leadership	4. Grounding the discussion 5. Governing 6. Planning the project on the lowest granularity
Managing Requirements	7. Gathering requirements 8. Managing changing requirements 9. Having common understanding of requirements
Back-end Development	10. Consolidating all available information 11. Working with poor data quality 12. Maintaining the new data structure
Front-end Development	13. Creating a standard report that covers all user needs 14. Making reports in a way that is optimized for human behavior
Dealing with Constraints	15. Collaborating with unavailable team members 16. Completing project in limited time 17. Dealing with Technical Limitations
Users Lacking Understanding	18. Overcoming Data literacy of user 19. Making users independent 20. Making users familiar with new principles 21. Creating training materials that will help anyone
Motivating User Adoption	22. Collaborating with uninterested users 23. Taking users from old way of working to new solution

#### 4.2.1 Adapting to new situations

As a consultant, per definition one is constantly in new situations. They go from project to project, meaning they face new organizations in new industries every time. Furthermore, these engagements are typically short in duration, meaning that consultants must catch up quickly.

##### 4.2.1.1 Adapting to new organizations

When consultants arrive in a new organization, getting familiar with new systems is challenging, as pointed out by BACH (22). Furthermore, each organization has their own unique set of processes, as remarked by BACH (26) and MNL (28). BACH explains:

*“The business model is probably the most probably it's easy, relatively easy to understand. The difficult thing is to understand all the processes [...], a big company that sells oranges this could be easy to understand the business model, but you don't know what happens in the inventory department, in the plants, overseas”.* (BACH: 64)

MNL adds remarks the same thing and adds what makes those new processes so challenging to adapt to:

*“When you don't have a standard organization or you have processes that are not the standard within organization, then you cannot reuse what you have created before or you cannot apply directly your experience to it. You need to learn again what they have there because it's unique to them.” MNL (28).*

The output from all these different processes typically results in a rather complex data landscape, according to MCH (46) and DCH (34). Even organizations that have built reliable data warehouse solutions are eventually hit by the complexities of real business life, like restructuring and transformations. As an example, DCH mentions that things that were built for the company 15 years ago do not even belong to the company anymore, and that nobody knows who built it:

*“Documentation tends to be really weak, particularly BI space.” (DCH: 34).*

Which is triangulated by a BI industry expert, who states the following challenges:

*“The available metadata is not self-explaining [...] Definition of common calculations are not available to everyone [...] KPI definitions aren't common knowledge” (Hilgenfort, 2022c)*

#### *4.2.1.2 Adapting to new industries*

Similarly, working in new industries can be challenging as well. Although there are many similarities between different industries, you also deal with data that does not even exist in other industries, which requires extra research to understand (BACH: 60; MCH: 78). The ways of working can also differ significantly between industries:

*“... typically pharma because it's a very regulated, very validating environment where we are used to things in very specific control structure ways and to move into, using my example industrial products, which is a bit of a chaotic environment. [...] It's quite challenging from a consultant perspective to really adapt yourself. Okay kind of forget everything you know or everything you are used to” (SMCH: 37).*

#### *4.2.1.3 Keeping up with the steep learning curve*

When consultants are getting used to these new situations, they must do so rather quickly. As 4.2.6.1 Dealing with Time Constraints describes the time constraints that consultants have to deal with, so as a logical consequence of having to do catch up with many things in a limited time, consultants are required to have a steep learning curve. Both managers point this out (MCH: 46; MNL: 20)

## 4.2.2 Project Leadership

The challenges in Project leadership refer to the part of the project that plans and manages the engagement with the client. It is where the goals and the target-state of the entire project are set, where the governance is defined, and where a planning to go from the as-is to the to-be is drafted. The challenges in project leadership refer to the higher-level project overall.

### 4.2.2.1 Grounding the discussion

The self-service aspect typically excites clients, but it is not the perfect solution. Despite their own enthusiasm for SSBI, consultants should not lose themselves in the client's excitement and must work to ground the discussions: showing both the possibilities and limitations of SSBI. DCH describes the following scenario:

*“[SSBI] is sometimes also a lie, right? An internal lie because you can, you can sneak away with you help yourself, you did it. [...] you give them a data model [but] [...] once you want to extend your data model you're still with the BI specialist” (DCH: 22)*

### 4.2.2.2 Governing

Furthermore, the implemented solution must be governed as well. DCH (28) describes a situation where SSBI led to a client having 500 queries flying around, in addition to the 300 IT-provided reports. While it is great that users can serve themselves and thereby reduce the pressure on the IT-department, this presents problems when system updates have to be performed, or worse yet, when new systems get introduced for the very IT-department that was meant to benefit from the self-service aspects. It is important to define the roles of business and IT in this process as well – they must be aligned. This is a complex undertaking where, according to DCH (40) the consultant has a strong role:

*“you can have very annoyed clients and clients when you then think you make self or themselves independent but it's actually you as an IT organization, you can no longer than move on and do upgrades without annoying them a lot [...] Implementing the governance is quite difficult. It's not difficult within IT within BI. We say okay, this person is responsible for the front end, this person is responsible for the back end. [...] that's all well organized in IT, but it's still a challenge you know, bridging IT and business have it and then have a clear governance in place” (DCH: 28, 36).*

#### 4.2.2.3 *Planning the project on the lowest granularity*

When the overall target of the project has been established, including governance, the project will be planned. That is, the final and intermediary deadlines and deliverables are agreed upon. This must be done on the lowest granularity, per report, or per key performance indicator (KPI) (MCH: 48). This is both difficult to do and will have severe consequences if not done properly. MCH recalls:

*“And what I have seen in one of the big projects [...] the project got heavily delayed by data quality in the source systems and data that was there was quite far from the new information model that the company was trying to build. So it took also a lot of time for them. For the client organization to understand how they would need to transform their data from from the Old World to the New World.” (MCH: 52).*

#### 4.2.3 *Managing requirements*

When the overall goals of the project are set, the requirements for the individual parts, like reports, are gathered by consultants. The tricky parts for consultants here are getting requirements from people who speak a different metaphorical language from you, managing changing requirements, and not being able to fully test your understanding until the later stages of the project.

##### 4.2.3.1 *Gathering requirements*

Gathering requirements is a core part of getting the SSBI solution to work. The self-service aspect of the tool means that the tool must fit to its users well and that it should do what its users need it to do. The challenge with gathering these requirements is two-fold. First, users generally do not speak the same metaphorical language as consultants, especially when they are migrating to SSBI from something like Excel. BACH (42) and MNL (22) describe that scenario and how it is difficult to extract the things consultants need from users whose perceptions are based on Excel or who have generally more functional perspectives. In addition, SMCH (22) and MNL (22) describe how requirements are often given by stakeholders who themselves are not operational and will thus likely not be users of the new tool:

*“you interact with different user types or stakeholder types. And the ones that let's say that the real end users, [...] maybe are not the ones that that gives you the requirements” (SMCH: 22).*

It should also be noted that gathering requirements is not as straightforward as every user requiring the same thing. Ingo describes the importance of personas in SSBI, with different user categories having vastly different needs, also based on their culture.

*“Some people will love let's say more the visual aspect and then there are people who like it was because that helps them focus on the raw numbers. I don't have let's say much exposure to the Eastern cultures to building reports. For example, in Asia or in areas where they read from right to left.”* (MCH: 76).

#### *4.2.3.2 Managing changing requirements*

When consultants start designing based on the gathered requirements, they have to keep flexibility in mind. It is not uncommon that requirements change or get added to during the project. If this flexibility is not kept in mind, it can result in change requests for the client, which are expensive (MNL: 39). Changing requirements are not easy to deal with; often models are created based on the constraints at the time and changing these after the fact can mean that those models have to be redesigned entirely (BACH: 54).

#### *4.2.3.3 Having common understanding of requirements*

As discussed in 4.2.3.1, gathering requirements can be challenging as consultants have different perspectives than users do. Furthermore, 4.2.3.2 discussed how requirements often change. As a result, misunderstandings are bound to happen, as pointed out by both SMCH (24, 29) and MNL (39). The difficulty here is that these miscommunications are typically only found out at the later stages of the project, when solutions are being presented to users. That makes these phases particularly challenging.

*“the most difficult part is or has been is and will always be I think, the testing phase testing phases. [...] it's because that's where you really confront the expectation of your end user with your understanding of the requirements [...] then a lot of misunderstandings and miscommunications and arguments start. And some of them even end up in change requests that are expensive for the client and they don't like that [...] you could do everything correct since the beginning, [...] Even like that, they will there will be misunderstandings.”* (MNL: 39)



#### 4.2.4 Back-end Development

When the requirements are in, the consultants can start to build the actual solution itself. This starts at the back end of the systems, with the data that is the input for the analytics. The complexity of these systems was already discussed in 4.2.1.2. This chapter will highlight challenges related to consolidating all available information, the data quality, and the maintenance of the new data structure.

##### 4.2.4.1 Consolidating all available information

As a result of the complexity as discussed in 4.2.1.2, consolidating all information in an organization is no easy feat. BACH (12) describes the importance of a single source of truth, but also notes that the puzzle is often not complete (22). Batch level information is often not enough anymore, with the need for real-time information, and it is often the consultant's job to enable this (SMCH: 26). This is also triangulated by an industry expert's blog. He lists several challenges related to data sources:

*“The data sources might not be as easy to access as they should be [...] Master data hasn't been aligned (one of my favorites) [...] Data isn't always "good to go" for the data visualization part and some data source need to be prepared” (Hilgenfort, 2022c).*

The very nature of organizations nowadays tends to increase the complexity:

*“But there are some of those projects have been quite cumbersome or complex is because the scope has been really broad. So they want to cover first in quantity several companies at the same time talking about holdings that involve several subsidiaries from a company and specifically for planning these, these processes could vary a lot from one to another.” (MNL: 18)*

SMCH seconds this, even if the organization does not have several subsidiaries, the different departments already have very different data:

*“If you want to do a self-service implementation that needs to be harmonized and common across sales and finance. There the first challenge start [...] The sales guys of course, they might need to have data that is not available on the ERP system, like more market related data that needs to be [...] while from a finance perspective... They are yeah and more ERP driven data Financial postings, and so for them, it's so it's a bit a different data set that they want to look at [...]” (SMCH: 28)t*

#### 4.2.4.2 Working with Poor data quality

BACH points out that when consolidating the system landscape and its data, it often becomes apparent that no proper data maintenance has been conducted (22). Many transformations need to happen to make the data workable (Hilgenfort, 2022c), which is highly complex. This poor data quality is difficult to work with:

*“[My experience with data quality is] Not good. Because that's where things start to get tricky because you need to to adapt those structures or more than rather than the structure more than do you need to review the quality of the data because the output of the report or the system is as good as the data that you feed it” (MNL: 33).*

And the analyses are only as good as the data they are based on, or as SMCH eloquently puts it:

*“It's all about data right. [SSBI] is just an enablement because at the end again, the S-word in S-word out (laughs)” (SMCH: 39).*

#### 4.2.4.3 Maintaining the new data structure

This new data structure that the consultant created, with the improved data quality, now needs to be documented and maintained properly so that it is scalable for the future, to prevent situations like the one DCH (34) described. New structures are created and consultants must control whether such structures already exist in the system (BACH: 44). The need for proper maintenance and documentation is especially large when performing manual adjustments to data:

*“they have a platform that is connecting just to the part of their source systems, not to all source systems. And then the rest needs to come manually. [...] What makes challenging is then to ensure the data integrity once you start uploading flat files or adding manually data, you increase the chance that something will go wrong” (MCH: 40, 42).*

#### 4.2.5 Front-end Development

Depending on the level of SSBI, often standard reports are created in addition to which users can perform their own analyses. Examples of this include standard weekly or monthly reports, like sales reports. When the data is ready, these reports can be created. The creation of these reports sounds straightforward, but BA (42) states that is not the case. New reports have to be created that need to take all users' needs into account, and the design of the reports themselves is an art.

#### 4.2.5.1 *Creating a standard report that covers all user needs*

Going from a solution like Excel to an SSBI dashboard is complex because those solutions were designed in purely functional terms – users typically do not think in SSBI terms prior to using SSBI tools (BACH: 42). As such, the existing tools often use a lot of exceptions that are hard to transform into new solutions.

Another challenge are standard reports for different business units (BACH: 52, SMCH: 28, MNL: 18):

*“Each of them contributes differently because they're just expressing their opinions in order to cover to their needs [...] The trap is that everyone then will ask for more and more for further for further basically, adjustments of let's say, common report. And this could easily lead [...] [to] a non-viable solution”* (BACH: 52)

#### 4.2.5.2 *Making reports in a way that is optimized for human behaviour*

MCH (68, 74) describes the art of report creation. A consultant is essentially given a blank sheet of paper and must decide what to show, how to show it, and where it goes. This should be done in a way that is easy for users to digest, which MCH describes:

*“But the more visual you go [with software to create reports] [...] You may end up with, let's say too many options of [visualising the data] [...] And then you kind of have to become not only a data analyst, but also a psychologist or understand human behaviour. So there are some studies that have been done that and also depending on the culture, we live in, when you open a report, [...] you look on the left and then look into the middle and then you look on the top right. So also these kinds of clues about human behaviour can help you design report that is catchy. And you put the most important information to the areas where the human eye will naturally wander to.”* (MCH: 68, 74).

Hilgefort (2022d) describes this as well, formulating four rules and one exception for dashboard design: it should fit onto a single screen, the most critical information must be highlighted in the top left as that is where users look first (in Western cultures), the next most important information should be in the middle of the screen, the top-right and bottom-left should display detailed information. The exception applies when the dashboard is for an audience that expects a certain structure, like a sales audience expecting a sales funnel.

#### 4.2.6 Dealing with constraints

The main constraints for consultants in a typical project, besides constraints in their knowledge or skills as discussed in previous chapters, are the time that is available to achieve the goal, as well as the limitations imposed by the tool to be implemented.

##### 4.2.6.1 *Completing project in limited time*

It is common knowledge that consultants deal with severe time constraints. During a project, there are usually many things to do and not a lot of time to complete them. These time constraints are particularly challenging in the later phases of the project, like testing and cutover, as those phases themselves have many tasks to achieve and consultants have to catch up with delays from previous phases (BACH: 76; MCH: 48; MNL: 26, 41). Furthermore, the complexity of projects often means there are many dependencies that must be managed:

*“you always have a very tight schedule and you have a (unintelligible) book there with hundreds of tasks that a lot of people need to perform. If one of them is not correct, then the whole waterfall it is delayed.”* (MNL: 41).

##### 4.2.6.2 *Collaborating with unavailable team members*

Implementation projects are team projects. Consultants will be working together with other consultants as well as together with client stakeholders. Those could be the users of the new tool, stakeholders whose inputs are required for the solution (like architects), leadership stakeholders, the list goes on. The consultants are not the only people with time constraints, though. The client also has internal deadlines and busy periods, or periods where most client team members are on holiday. This can be troublesome, as consultants must work closely with the client team members to gather requirements, build the solution, and train the users.

*“the training for the for the deliverables that was done in the beginning of July. So you have to do the training during July and August, which is not the best period to do a training when most of the employees are on vacation.”* (BACH: 72).

In addition, these projects are often international, meaning the consultants will work with team members from different countries. Aligning on things as complex as SSBI implementations is challenging if you have but few common hours due to time differences (BACH: 58).

#### 4.2.6.3 *Dealing with Technical Limitations*

A key component of an SSBI implementation is of course the SSBI tool being implemented. When working on the back- and front-end development in the SSBI solutions, there are often technical limitations that consultants must overcome. A cause for this can either be because of the maturity of the tool (SMCH: 22; MNL: 22), where tools that are not as mature obviously do not have full functionality yet, and new features are being implemented with every release. Another common cause is that the client has very specific requirements, that the tool would not reasonably have an answer for (MCH: 88, BACH: 44).

#### 4.2.7 Users lacking understanding

Especially in the cases where a client organization implements SSBI as their first Business Intelligence endeavour, end-users tend to lack understanding of the new technique. The data literacy has several implications and the lack of understanding makes it difficult for consultants to help them become independent users.

To increase the users' understanding, consultants give trainings. During trainings, consultants train users both in the use of the new tool, as well as in principles of SSBI to avoid common pitfalls (MCH: 32). Unlike in traditional BI, consultants will train business users, not just power users (DCH: 53). The challenges here are to make those users familiar with new principles, to develop materials that will help anyone, and for some consultants to present in front of a large audience for a long session (BACH: 34).

##### 4.2.7.1 *Overcoming Data literacy of users*

The data literacy of users has major impacts on the rest of the engagement, as discussed by BACH (12, 48, 74), MCH (24, 26, 38), and SMCH (39). First, low data literacy is one of the main reasons why training is necessary. Furthermore, consultants need to guide and protect the user from making wrong decisions, or at least decisions based on incorrect analytics, so consultants need to keep this in mind during the entire development cycle. Low data literacy can also lead users losing faith in the SSBI tool:

*“even if the the the capabilities that the self-service tool enable are fantastic, [...] but then they cannot make sense of all of the data, because the data is just terrible. And that's it's difficult for for an end user to understand that. Maybe the problem is with them because they might be the owners of the data. [...] But for them if the results are wrong, or*

*if they do something and they don't see what they expect. Typically they think the problem is the tools” (SMCH: 39).*

#### *4.2.7.2 Making users independent*

The goal of SSBI is of course that users will be able to serve themselves, without the support from the BI experts. In the hypercare phase of the project, consultants work together with the client team to help them with their day-to-day work in the new tool and to gradually make the users independent from the consultants. A lack of understanding also complicates that process (BACH: 48, 74). Not only do users have to know what they are doing to get the correct results from analyses, they also have to perform proper maintenance. If this phasing out is not done correctly,

*“you just have a situation where you're constantly receiving requests from the client.[...] theoretically and official there is an end to the project but unofficially you could be continuing having some users very dependable on the consultant which again is part of consultants job for this to not happen” (BACH: 74).*

#### *4.2.7.3 Making users familiar with new principles*

The goal is to make users self-sufficient and to prevent them from making decisions based on wrong data, but that is not straightforward (MCH: 24). Especially when the implementing organization is moving from tools like Excel to SSBI, consultants will need to teach users about a new way of thinking – model-based instead of table-based (BACH: 14; DCH: 47). The difficulty here is of course dependent on the client’s knowledge and prior solution; if the client is very tech-savvy or just migrating from one SSBI tool to another, consultants should have to explain many new principles – at most highlight the differences between tools and possibly introduce new features.

#### *4.2.7.4 Creating Training Materials that will help anyone*

This challenge seems to depend on the project. Where some projects have different rounds of training for different audiences (MNL: 22), consultants typically train a large group of users at the same time (BACH: 14; DCH: 53). It is challenging to create training materials that are relevant for each user in the group as each user will have a different level of experience in IT – where some users may need a lot of explanation, others will be bored by what to them is obvious.

Furthermore, these mixed large groups of users will consist of different functional areas, like sales and finance (DCH: 53). This means that consultants cannot just create a prescriptive training of how to perform certain finance functions. Instead, they must come up with more general trainings to illustrate the possibilities that SSBI offers.

#### 4.2.8 Motivating user adoption

To achieve the value that SSBI promises, users must adopt the solution and actually perform analyses. For consultants, the difficulties here lie in the collaboration with uninterested users and in taking users from their old way of working to the new solution. This was particularly difficult in times of COVID, when consultants could not be physically present: *“human interaction plays, at least in consulting, a huge impact of persuading the client and the colleagues”* (BACH: 58).

##### 4.2.8.1 Collaborating with uninterested users

Unlike compliance projects, SSBI implementations are generally not imposed on the organization. As such, many users are open and willing to adopt new technologies (BACH: 12). Within organizations, though, the implementation of an SSBI solution can be imposed on employees, for example if the organization is migrating from one tool to another as a strategic decision by IT (SMCH: 22). Especially users who are not close to the use of the tool are often not interested (BACH: 28), making them difficult to work with. MNL:

*“Some of the most boring parts is to plan the cost and expenses of a cost centre of an unit because people do not like that [...] with this exercise, they really they're really forced to try to forecast the future [...] And they don't like that kind of things [...] They want to manage their team for example, the people from HR, they need to do this as well [...] But that's not their primary goal. So again they want to focus on some other processes of HR [...], you can you can really see how not interested they are (laughs)”* (MNL: 24).

##### 4.2.8.2 Taking users from old way of working to new solution

Whether the old way of working was Excel, traditional BI, or another SSBI tool, users must move to the new tool. As the complex SSBI principles are new to the users, they might be tempted to just stick to their Excel, but then benefits will not be realized (BACH: 48). If there is already an SSBI tool in place, users will be used to that system. During the implementation process, they will compare their fully operational system that they are used to, to a new system that they have not seen (SMCH: 31). In those cases, convincing users to switch is a difficult task.

### 4.3 Strategies

When the interviewees spoke about the challenges they experienced, they often also mentioned what strategies they used to mitigate these challenges. Having combined those answers with the researcher's observations led to the researcher defining four categories of strategies with eight strategies as depicted in Table 5.

As opposed to the challenges that are formulated as present participles, strategies are formulated in the present simple mood. They can be thought of as answering the question: What can consultants do to mitigate a challenge? E.g., They can leverage best practices.

**Table 5: Consulting Strategies to Manage Implementation Challenges**

Category	Strategy
Leverage Knowledge Base	1. Learn from previous experience 2. Leverage best practices
Invest in the project	3. Invest time, money, and effort 4. Contribute to Personal Development
Focus on the User	5. Train the user 6. Engage users by showing benefits 7. Adjust level of Self-Service and define user groups
Transparency	8. Work transparently

#### 4.3.1 Leverage knowledge base

Although it is true that consultants often find themselves in new situations, those situations are typically not fully foreign to them. Consulting firms often have vast internal knowledge that consultants can tap into, or at least have best practices that they can fall back on.

##### 4.3.1.1 *Learn from previous experience*

A big part of the consulting business model is leveraging past experiences. Consultants may have worked on a similar project before, know someone who did, or have materials available in the firm that can be leveraged (SMCH: 37; MCH: 84, 86). SMCH (12, 16) and DCH (10) furthermore suggest that past experience implementing traditional BI may help implement SSBI as well. Part of being a consultant is doing research, both actively by researching the client prior to an engagement, as well as 'passively' when you may not be assigned to a project, but work on a proposal for a project (MCH: 84, 86). Finally,



consulting is a team sport, so it takes only one consultant in a team to be able to bring the rest of the team up to speed:

*“as a young consultant you also should be able to rely on the project leaders to provide that extra guidance and expertise.”* (MCH: 86)

#### 4.3.1.2 *Leverage best practices*

In addition to previous experiences, consultants often use best practices during their engagements, which help save time. These could be industry best practices, standards, among others. MCH (68) mentions the IBCs as an example: the international business communication standards that are used outside of SSBI as well. These guidelines help report design and can help making reports in a way that is optimized for human behaviour (4.2.5.2). Another best practice are product demos (SMCH: 31): these are prebuilt SSBI reports based on dummy data highlighting some functionality of the SSBI tool. This helps clients compare a new tool they have not seen to their existing solutions and can help consultants convince clients to adopt the new tool. Within SSBI specifically, there are also best practices regarding report design and performance management.

#### 4.3.2 Invest in the project

To overcome challenges in time constraints, managing requirements, and technical limitations consultants can invest in three different categories: time, money, and intellectual effort. They also invest in themselves by contributing to their personal development.

##### 4.3.2.1 *Invest time, money, and effort*

As established in section 4.2.7, consulting projects typically have strict time constraints. It is no secret, and the author can confirm from his experience, that consultants typically work longer hours, which helps in achieving the project on time. The investment here specifically refers to overtime, working more than 40 hours per week standard. Both the consulting and client party typically invest by deploying dedicated project managers who are responsible for the successful and timely implementation of the projects (BACH: 76).

In the beginning of the project, consultants can also reduce the time constraints by investing into the planning. A cheap option would be to have the planning performed by salespeople who are not as familiar with the implementable solution and would basically guesstimate how long it would take for each part of the project to be done. Alternatively, investing into consultants who actually configure the systems to make the plan leads to a more feasible plan:

*“And I have seen the when that happens is consulting companies try to reduce costs at the beginning. They end up first getting the project because it is cheaper than the competitors, which make them really happy at the beginning. But then living a nightmare the upcoming months because they are not able to deliver what they promised” (MNL: 26).*

Finally, to manage technical limitations of the tool, consultants invest intellectual effort in coming up with an alternative solution to present to the client, even if it is less automated or elegant (MCH: 88).

#### *4.3.2.2 Contribute to Personal development*

Consulting is known for its fast pace and ability for its consultants to quickly climb the ranks. As such, as observed by the author, many personal development possibilities are made available to the consultants, which help manage challenges. To feel more confident about public speaking during trainings, Deloitte offers pitch trainings as well as public speaking trainings where consultants can improve their skills. Trainings about the SSBI solution that gets implemented help manage challenges of back- and front-end development, like maintaining data structures and developing optimally designed reports. Taking such trainings and getting certified in the implemented tools is strongly encouraged.

Finally, consultants are not always engaged on projects. When they are on the so-called ‘bench’, they can help with proposals where they have the opportunity to learn more about new clients or industries (MCH: 26), or contribute to the knowledge base, e.g., by documenting their previous experiences or building demos.

#### 4.3.3 Focus on the user

The user is ultimately the key to unlocking SSBI’s value, as they will be performing the analysis. Therefore, it makes sense that the solution is designed with the user needs and capabilities in mind – consultants can tailor the solution to the client organization and a fitting solution will cause fewer challenges. If the users are not skilled enough, they have to be trained. Relating to users can help both motivating adoption as well as make training uninterested users less challenging. To engage users, consultants can show them the benefits they can get out of the project. Furthermore, making trainings interactive helps dealing with the training challenges.

#### 4.3.3.1 *Adjust level of self-service and define user groups*

No clients are exactly the same and not all users in the client organization have the same needs. As such, consultants can customize the SSBI solution for their clients. They can adjust the level of self service and define user groups.

Each client will have a different technical maturity. Based on the users' data literacy combined with the quality of the available data, the level of self-service that the tool offers the users can be adjusted by the consultants (MCH: 22). As an example, if the data is of poor quality and the users are not savvy enough to deal with that, the consultant will expose less data to the user. The consultant can also build more standardized reports to cover common needs. Although this reduces the self-service possibilities, it protects users from looking at incorrect data. This reduces the impacts of the challenges of users' low data literacy and poor data quality.

In addition, not every user has the same information needs and capabilities – the levels of self-service can also be set on a user group basis (BACH: 44; MCH: 76). In his post, Hilgefert (2022b) argues for this as well. When designing these personas, he recommends consultants to ask themselves several questions about the user, like “*What are typical goals for this persona*”, “*What are typical reporting / analytics driven tasks*”, and “*What is an example for typical software the persona is capable of using*”, where the answers should match the level of self-service: “*Would you expect a user to create new dashboards when all they feel familiar with is a browser ? Perhaps not*” (Hilgefert, 2022b).

#### 4.3.3.2 *Train the user*

Stating the obvious for the sake of completeness: the strategy to deal with the challenge of users lacking understanding is to educate them by means of training. Consultants providing training is a standard part of SSBI implementation projects, as pointed out by all interviewees. The trainings do not only introduce the implemented tool, but also ways of working with the new possibilities, and common pitfalls to avoid. This increases both the users' data literacy and independence.

To make sure that the complex concepts are being understood, it helps to use examples that users can relate to (BACH: 30, 34). Rather than a theoretical training, consultants like to use real-life examples to illustrate the possibilities SSBI brings. The extent to which the material can be relatable to a user's function depends on the audience, of

course, yet it is almost always possible to use some sort of real world example that most users will be able to understand.

Furthermore, the trainings are typically hands-on trainings instead of lectures (BACH: 32). This helps users get familiar with the tool and get a sense for the principles of SSBI practically, rather than just theoretically. This should also promote user adoption.

#### 4.3.3.3 Engage users by showing benefits

As stated by BACH (30): “engagement with a tool [...] is highly correlated with the benefits its user will see and get from the implementation of the project.” As MCH (62) points out, that does not just mean the improvements that an SSBI tool brings in terms of automation of ‘boring work’ (BACH: 28), but also other potential benefits for users. Finding those benefits can help motivate uninterested users.

*“and there are different motivation factors, either that they see that it's new technology, for example. So it also would look good on your CV Right? Or it can be that they get to experience something else rather than their operative work. [...] They may get a role in the project. So to experience to lead something or to design something. [...] So there are project where the project success has an impact on their evaluation. Also on the bonus for example” (MCH: 62).*

#### 4.3.4 Transparency

Every project comes with its limitations that can cause challenges. Examples include technical limitations when client requirements are too specific for software vendors to offer a solution for them (MCH: 88), limitations of a consultant’s understanding of the organization (BACH: 64), limitations in the quality of the data (MNL: 35), and limitations of the users’ ability (DCH: 22). It is important for consultants to be aware of those limitations and to be transparent towards the client about them while coming up with solutions. For the data quality, for example, consultants can only do so much. Data is generated at a transactional level, and depending on the consulting engagement, fixing the data at the source might just be outside the scope (MNL: 35), meaning that the challenge of consolidating the data is not for the consultant to tackle. This has obvious consequences on the entire project, of which the client should be aware.

Another way that consultants can be transparent, is working in an agile way. As opposed to a traditional waterfall where deliverables are only shared with the client at the

end of an engagement (period), agile ways of working present the final solution incrementally, starting with a minimum viable product (MVP). This allows the consultant to check their understanding of the requirements against the client's meaning of the requirements during the project, when they can still make changes if required (SMCH: 29, 35). This makes the requirements more collaborative, concrete, testable, and reduces related challenges.

## 5 DISCUSSION

This section discusses the results of the analysis. It first highlights several findings that are not necessarily challenges or strategies, but are still interesting insights nonetheless. It then aims to identify which challenges and strategies are specific to SSBI consulting and which ones may apply to consulting or IT consulting in a broader sense. Furthermore, it aims to relate the findings to literature. Finally, the limitations of the study will be discussed.

Gioia and co-authors (2012) describe the need for what they call the “willing suspension of belief” during the analysis, where researchers should be aware of the previous literature, but not be so stuck to it that they only focus on those insights and are no longer fully open to new ideas. This attitude led to several interesting findings.

As an example, an interesting finding relates to the stages of SSBI as defined by Alpar and Schulz (2016). The third, most advanced, stage of SSBI they describe relates to the ability of users to easily add data to the analyses. DCH (22) sees the industry moving towards that stage more and more:

*“over the last 20 years in my experience [SSBI] was primarily to the front end side. So you give them sort of a data pool and then on top of that people freely build their queries [...] but now the new way of working is to also go to the backend side where you [...] drag in data sources and build your own data flows.”* (DCH: 22).

SMCH (16) also sees a bright future of SSBI. He agrees that SSBI does not bring new insights that BI could not, but does note that now regular users have more power in unlocking those insights:

*“the type of work that was required the type of skills that are required from the end user, also, has shifted, and these end users ten years ago, are not the same generation of users as of today”* (SMCH: 16).

Regarding the users of SSBI, literature often defines executives to be one of the business users that SSBI is for (Bani-Hani et al., 2018), but in practice it seems that they are more consumers of SSBI reports than users of SSBI, according to DCH (45) and SMCH(24). DCH (45) speaking about working with CFOs:

*“you self-service whatever you want [...] just prepare the data for me. And if [...] something is wrong you're going to generate that data and put this into PowerPoint”*

## 5.1 Discussion on the Challenges

The researcher specifically chose for a larger number of categories instead of grouping categories together. The goal of this was to promote clarity and to make it easier to define which categories are specific to consulting in SSBI implementations, IS implementations in general, and all of consulting. Furthermore, front- and back-end development could be grouped into one larger development category, but the author knows that in some cases, different consultants are responsible for each. As such, splitting them up into two groups would make it easier for the different consultants to easily find which challenges they can expect.

### 5.1.1 General Consulting Challenges

Looking first at which challenges are general consulting challenge, it is almost obvious that adapting to new situations and dealing with constraints are universal consulting challenges. Any consultant will be dealing with new organizations in new industries (unless one has an industry focus, of course), as that is a key characteristic of consulting (Bourgoin & Harvey, 2018). A survey conducted by a former McKinsey and Deloitte consultant with over 4200 respondents found that more than 50% of consultants work more than 50 hours per week, with only 6% working less than 40 hours (Yang & Rusche, 2021). These long working hours are logically related to the amount of work to be done, proving the universal nature of time constraints as well. The challenges relating to technical limitations and understanding a new organization's complex data landscape are specific to implementation consulting (if you are not implementing a technical solution, that solution will also not have technical limitations to deal with and if you are not interacting with or making use of the complex data landscape, you will not need to understand it), but not exclusive to SSBI implementations.

Managing requirements can be split into a part that is universal and a part that is specific to IS implementations. Obviously, each project will have some requirements – otherwise what do the consultants do (or how will they know what to do). An engagement where every requirement is set beforehand and does not change would be extremely rare (if it exists at all), so it is fair to say that changing requirements is generally difficult – in all aspects of consulting. Nissen (2018) identifies flexibility as one of the key challenges of the modern consulting firm and IT service provider, including flexibility during the collaboration with the client in the engagement.

Part of the challenge of gathering requirements relate to getting requirements from stakeholders who may be further away from the action, which can happen in any form of consulting and is also pointed out as a challenge by Young (2002). What is by definition more common to consulting on IS implementations are the challenges brought up regarding communicating with functional stakeholders and translating those functional requirements into the technical solution. Young proposes several strategies to combat these challenges, several of which were also mentioned in the interviews: asking context-free questions in interviews to not “lead the witness”, analysing documents as an additional source of requirements, conducting workshops to collaboratively gather requirements from a group of user, prototyping to get feedback on one’s understanding of the requirements (like building demos and MVPs as detailed in sections 4.3.1.2 Leverage Best Practices and 4.3.4 Transparency), and use case diagrams or other modelling methods.

### 5.1.2 IS Implementation Consulting Challenges

Next, several challenges relate to IT implementations broadly. Those challenges are back-end development and front-end development. It almost goes without saying that if no IS solution is being implemented, no IS solution has to be developed, neither on the front- nor on the back-end. At the same time, it is not SSBI specific, as SSBI systems are obviously not the only IS that can be developed and implemented.

Dashboard design challenges, as discussed in the front-end development section, are typical in traditional BI. Sarikaya et al. (2018) describe challenges relating to flexibility for end-users (which SSBI aims to address, the data literacy of the users as discussed in section 4.2.7 Users lacking understanding, data design of the dashboards and social impact of those dashboards. Furthermore, with the availability of evermore data, it is also a challenge to choose what to show (Malik, 2005). The SSBI challenges as identified by Lennerholt et al. (2022) related to Creating Reports are different from the challenges brought up by the interviewees. None of the interviewees expressed difficulties creating or changing content, but rather commented on the difficulty of creating standardized reports for varying user needs and reports optimized for interpretability.

Data related back-end challenges are a common implementation issue. In fact, interviews often credit ERP systems and other transactional systems with playing a role in creating such a complex environment (MNL: 35; MCH: 78) and challenges as discussed by Hilgefort (2022c) are troublesome for transactional systems too. Boyton and co-authors (2015) found that a stable and dependable back-end is actually one of the technical



success factors for a BI implementation. They furthermore found poor data quality to be a failure factor for BI. Finally, in SSBI two of the five categories of SSBI challenges as defined by Lennerholt et al. (2022) (Table X) are access and use of data and data quality respectively. While the interviewees mentioned several of the same challenges, like the data sources in multiple environments, control of data integrity, and difficulty of correcting low-quality data, other challenges that Lennerholt and co-authors identified were not brought up by the consultants, like using correct data queries and low awareness of using faulty data (which is actually confirmed to be challenging for end-users by MCH (24) and SMCH (39)). It seems thus like the two categories of challenges identified by Lennerholt et al. (2022) also apply to consultants, minus the ones caused by business users' inexperience with working with data, and for different reasons (consultants are unaware of data sources because of being new to the organization, not because of not understanding data).

It should be noted here that the interviewees' experience with the specific challenge of access to data are not aligned: MCH (44) mentioned "*usually what I see is that organizations they often have a very clear view who should see what*", whereas BACH (22) describes it more as an "*incomplete puzzle*". This could be explained by DCH (34) who has experience with organizations having reliable data warehouses until transformations occur; perhaps BACH's experiences relate to organizations post-transformation, whereas MCH's experiences could be from before that phase.

Motivating user adoption and users lacking understanding have several challenges that are general implementation challenges, whereas the rest are specific to SSBI. In the category of motivating user adoption, collaborating with uninterested users, for example, is also troublesome in enterprise systems (ES, like ERP and CRM) implementations, according to Wagner & Newell (2007). Furthermore, users' low interest in SSBI is also one of the challenges found by Lennerholt and co-authors (2022), but more in the context of adoption than in working together with consultants during the implementation process. Wagner & Newell (2007) also highlight the challenge of user participation and taking users from old ways of working to the new way in such implementations, but this author would argue that the challenge there is slightly different from the challenge in SSBI implementations, which he will explain in 5.1.1.3.

Users lacking understanding is also troublesome in other implementations, but in a different way as will be explained in 5.1.1.3. Overcoming data literacy of users can be considered to be a general challenge.

### 5.1.3 SSBI Consulting Challenges

Finally, some aspects of users lacking understanding and motivating user adoption are specific to SSBI. As already hinted in 5.1.1.2, motivating user adoption is a slightly different challenge from other implementations, like ES implementations. ES is typically mandatory for users to use, for example for compliance reasons. A user in the finance department cannot just perform their duties outside of an ERP system, they must work in the ERP. This is not the case with SSBI, as this tends to be implemented across functions. Users can still decide to not perform analyses or to stick to their personal Excel analyses, in which case the benefits of SSBI will not be realized. It is also slightly similar to traditional BI in that sense: users can *not* look at the analyses or perform their own analyses in Excel, but that is because traditional BI lacks the self-service component. In traditional BI, the BI experts can also monitor the users' usage of the system and blow the whistle if the dashboards are not being used. In SSBI, though, it is mostly up to the users to use the system and the value is derived exclusively out of them doing so. As such, this challenge is different in the context of SSBI.

Regarding the other challenges of users lacking understanding, those challenges are also different for SSBI implementations than for other implementations. For example, when implementing other systems, consultants generally do not have to introduce fully new principles: typically, users still input data, but in a different format, UI, or with fewer manual steps. This is a contrast with SSBI where now business users are performing analyses. As such, trainings are not about the possibilities a new tool allows, but how to perform one's job with the new tool – meaning they can be more prescriptive. Materials can then be developed with a more specific audience in mind. Finally, independence varies between SSBI implementations and other implementations in that in other implementations, users typically perform the same job but in a different system. Therefore, they are as independent as they were before, with some possible questions about a new way of working. In SSBI, they are given a completely new responsibility which changes the dynamic. In fact, in traditional BI, they were used to depend on BI experts for their BI needs. That makes the challenge unique for SSBI.

## 5.2 Discussion on the Strategies

It is important to note that the list of strategies is not exhaustive. As the strategies were only later added to the scope of the research, they were not extensively asked about to the

interviewees – just many were mentioned. It is for future researchers to find out more about the strategies consultants can use to overcome challenges.

### 5.2.1 General Consulting Strategies

As already discussed in 4.3.1, consultants typically have a vast knowledge base that they can rely on. This is most certainly not specific to SSBI, in fact it is one of the characteristics of the consulting business model and one of the key determinants of the organizational performance of consulting firms and other professional services providers according to Morris and Empson (1998). Obviously, creating demos of the tools to be implemented is specific to implementation consulting: without a tool, one cannot give a demo of said tool.

Investing into the project is also common across consulting, with the exception of investing money in the effort estimates early on as described in section 4.3.2.1 Invest time, money, and effort. Section 5.1.1.1. about general consulting challenges already established that consultants tend to work a lot in general, not just in implementation consulting. In terms of coming up with creative solutions to combat constraints, problem solving is of course one of the main tasks of being a consultant (Williams & Woodward, 1994), solving an organization's problem is the reason they are hired in the first place. Furthermore, consulting is known for its fast-pace and personal development is almost required, as many consulting firms have (or at least used to have) a so called "up-or-out" system (Malhotra et al., 2010) where employees are expected to either promote within a certain amount of time, or to leave the organization.

### 5.2.2 IS Implementation Consulting Strategies

In terms of Project Leadership, the planning on the most granular level is probably more effective a strategy for Implementation consulting, as these teams are typically much larger than the teams in e.g. strategy consulting where teams are typically smaller than 10 people (Carson et al., 2007), which increases the complexity of the planning and thus the need for a proper plan.

Although governance is important in every project (Müller, 2017), the challenges identified by the consultants here relate mostly to Business-IT alignment, which is logically more relevant during IS implementations, as Business-IT is a key topic in IS (De Haes & Van Grembergen, 2009).

Grounding the discussion in this context was about making sure that the client organization does not get lost in all of the benefits that SSBI could bring by also showing them the limitations – managing the expectations, if you will. Although the example here was given in the context of SSBI, Ginzberg (1981) found that organizations can easily have unrealistic expectations of their Management Information Systems (MIS) implementations. Ginzberg furthermore found a higher chance of implementation failure when users have such unmanaged expectations. As such, this can be seen as a challenge for IS implementations on a broader level.

It seems like focusing on the user is never a bad strategy. To be able to focus on a user, though, there has to be a user in the first place, like in IS implementation consulting. When implementing a tool, training the user is intuitively beneficial, especially when using real-life examples and giving them hands-on experience with the tool. Showing the user the usefulness of a system should help adoption in any implementation: perceived usefulness is one of the factors of the Technology Acceptance Model (TAM) that aims to predict actual system usage of a system (Davis, 1989). It stands to reason that finding a users' benefit to engaging in a project is similarly beneficial to their involvement in the project. Obviously, adjusting the level of self-service is a specific strategy for self-service BI.

Regarding transparency, Bourgoin and Harvey (2018) in their article on the challenges consultants face and the strategies they deploy to deal with them describe how consultants are sold as experts, even though they gain most of that expertise on the project itself. They argue that asking direct questions is dangerous because it might 'expose them'. It seems, though, that this is not the case for SSBI consulting and possibly IT consulting in general: both MCH (82) and BACH (66) state their experience with asking questions has instead been positive:

*“[My experience] has been rather positive [...] I have not [...] [received] a statement from someone saying you should have known this.” (MCH: 82).*

*“you're introduced to the company as an expert but not as an expert in the processes, at least in the technology consulting you are just presented as an expert in the technology that is going to be introduced” (BACH: 66).*

As such, although this technique might 'expose' consultants in other areas of consultants, it seems to help in IT consulting.

Agile as a transparent way of working is obviously also not limited to just SSBI. In fact, many of the authors of the Manifesto for Agile Software Development are consultants (Beck et al., 2001).

### 5.2.3 SSBI Implementation Consulting Strategies

It seems then that adjusting the level of self-service is the only consulting strategy that is specific to SSBI implementations. This strategy is in-line with the suggestions by Alpar and Schulz (2016) as well; that different users require different levels of SSBI.

## 5.3 Graphical summary of the findings

The findings were graphically summarized in Figure 1. The challenges are represented in the middle, with the strategies on either side. The colours show whether the tables are consulting wide, specific to IS implementations, specific to SSBI implementations, or a combination in case of a gradient. The lines between the challenges and strategies indicate which strategies can be used to overcome which challenges.



**Figure 1: Graphical Summary of the findings**

## 5.4 Limitations

Several limitations of this thesis should be discussed. The main limitation of this thesis is the same limitation that most theses that were written in the context of an internship suffer from: time constraints. Working more than fulltime for most weeks, while already having only four months to write a thesis is challenging. This challenge is exacerbated by also settling into a new country like this author did in the context of his international internship. Furthermore, personal circumstances have caused the start of the research to be postponed. Although the international experience has undeniably expanded his perspective and enabled the international context of this thesis, the time constraints meant several choices had to be made.

### 5.4.1 Literature Review

SSBI is an up-an-coming field of research. As the approach itself is new, logically the research is too. As such, there is a large need for more research on the topic (Lennerholt et al., 2022). The emerging nature of the approach makes it difficult to find many sources to build research on. As such, a lot of research was taken from the same authors as well as the larger field of BI, though requiring some educated guesswork to translate it to SSBI.

### 5.4.2 Research Strategy

Cavaye (1996) highlight the well-established notion that choosing a research strategy is a trade-off, as each research strategy has strengths and weaknesses; with many research strategies having strengths to combat another's weaknesses. As such, a pluralist approach combining multiple research strategies would be ideal to combat the case study's weaknesses of *exempli gratia* generalizability out of the case, but time constraints have rendered this impossible.

Furthermore, the study featured a single case design, meaning that only the challenges experienced by Deloitte consultants were investigated. As such, it could be the case that the findings are not generalizable to other firms; perhaps these are challenges that are specific to Deloitte or perhaps other organizations face additional challenges. As an example, one of the strategies of leveraging the knowledge base might not apply to a new consulting firm that does not yet have such a knowledge base. Although the case spans two countries, they are culturally relatively similar. As pointed out by multiple consultants, the design of the solution (and thus the challenges consultants might face) can

differ between cultures. It should be noted, though, that most interviewed consultants worked at different consulting firms in different countries prior to joining Deloitte.

### 5.4.3 Interviews

During semi-structured interviews, it is important that the questions are open-ended so that users can share their experience and so that the researcher is not “leading the witness” (Perry, 1998). For the most part, the researcher asked open-ended questions, but several examples can be found of a question including a yes-or-no section. In the view of the researcher, this did not impact the results, most questions were open questions.

The main question, formulated as a “what is the story of your experience with X” question as proposed by Perry (1998) was a mixed opening question. In some cases, it led to beautiful answers detailed the interviewee’s story with SSBI implementations, detailing its history et cetera (DCH: 22; SMCH: 16), but some interviewees found the question to be unclear (MCH: 18; SMCH: 16), so perhaps it could have been better formulated. In some cases, it led to a laugh, which can be seen as either a good way to break the ice, or as a non-serious start to the interview. Based on the casual setting of the interviews in general, the author tends towards the former.

Regarding the structure of the interview in general, Gioia et al. (2012) stress the importance of withholding judgement on literature while going into the interviews, to prevent possible confirmation bias and a situation where the researcher is blinded by previous literature, disabling them from finding new insights. The author of this paper has tried his best to be both informed by literature and to be prepared for the less structured part of the interview where topics had to be brought up, but to not be focused on only those topics. The author considers it a positive that so many of the topics on the list were brought up by the consultants naturally and that the list of topics expanded after the first interviews, meaning there was also space for new topics to be brought up. Of course, the risk remains that topics were missed because of them not having been brought up as topics by the researcher during interviews. Although small, it should be noted.

#### 5.4.3.1 Transcriptions

Transcription was one of these time-saving choices that had to be made as a result of the time constraints. The particular choice that was made is much related to the topic of the thesis. Instead of transcribing each interview manually, the recordings were transcribed

in real time by both Microsoft Teams as well as otter.ai. This drastically reduces the time required and acts as a failsafe as well. One might argue that the transcription process itself helps the researcher familiarize themselves with the data (Braun & Clark, 2006), but each interview was still listened to in its entirety to correct the automatically generated transcriptions multiple times and read without listening to the recording to see if the transcripts made sense by themselves as well (the process of which is described in 3.3.3 Analysis). Due to time constraints, manual transcription was simply not possible. By default, this also means that the transcription was word-for-word transcription. It should furthermore be noted that the interviewer and every interviewee speak English as their second or third language, so it is not uncommon for sentences to be started multiple times or for grammatical errors to be made. Unfortunately, in some cases the recordings were unclear, in which case the label [unintelligible] was used. Most of the times, only single words or small groups of words were lost, so this should not affect the findings.

#### 5.4.4 Scope

As the strategies were only introduced to the scope of the paper at a later stage, the list of defined strategies to combat the challenges is by no means exhaustive. During the interviews, no specific attention was paid to the strategies and almost no questions were asked about them, as they were originally out of scope. In line with the purpose of the paper, they were later decided to be added to increase the exposure of the new unit of analysis. Furthermore, the challenges were investigated from the perspective of one consulting firm, but it would not be unreasonable to expect that different consulting firms might have different strategies for managing challenges.

#### 5.4.5 Respondents

The number of respondents, being five consultants, is rather small. This is a limitation due to time constraints, both of the researcher and the availability of the consultants. Ideally, the researcher would have liked to interview at least two more consultants from the Dutch practice, but more would have been better. Some of the interviews were also cut short because of that same availability, but most interviews lasted about one hour, after which they naturally ended. Still, the saturation of the interviews was rather high, with the last interview mostly confirming observations from earlier interviews and explaining them slightly differently. The respondents did also cover the main criteria of years of



experience, level in the firm, number of tools used, and industry expertise, but it is possible that some of the missing industries have their own unique challenges.

Finally, although the respondents span most levels of consultants, there was an emphasis on more senior consultants. It is possible that more junior consultants experience more challenges during SSBI implementations as they tend to have less experience, which possibly makes things more challenging.

## 6 CONCLUSION

This chapter will conclude the thesis by briefly summarizing the thesis, highlight the results, discuss the implications, and finally make suggestions for future research.

### 6.1 Summary

This thesis first introduced self-service business intelligence (SSBI) as a next generation and solution to the problems of traditional business intelligence (BI). Its value proposition is to make users independent from the BI experts that they used to rely on for their analytical needs. If users would be able to conduct their own analyses, that would reduce the pressure on the IT department and allow the IT to focus on what they need to do, it would allow users to stop guessing and start making their decisions based on data, it would enable those analyses to be done on time, and it would finally shift the analytical landscape from a reactive one to a proactive one.

Despite its promise, SSBI implementations are challenging endeavours. Organizations often collaborate with consulting firms to implement the solution. Increasingly, research is being conducted into the field of SSBI, but the units of analyses are always at the level of the organization that is implementing SSBI and never the consultants who actually perform the implementation. This thesis aimed to change that by investigating the challenges consultants face during SSBI implementations and as such adds a unit of analysis to the literature.

To research this, the author conducted a case study about Deloitte, a global leader among Data and Analytics Services Providers, implementing SSBI at client organizations. Data was collected through semi-structured interview with five SSBI experts at Deloitte in both Switzerland as well as the Netherlands, who together have over X years of experience implementing SSBI. The respondents covered a large spectrum of the industries Deloitte serves and has a range from junior consultants to directors. The data were triangulated with the observations from the author as a trainee consultant, as well as an online environment where SSBI experts engage and discuss their challenges.

The data were analysed by means of thematic analysis, meaning the researcher played an active role in the definition of the main challenges and categories they fall into. Eight categories and 23 challenges were defined, as displayed in Table 4. During the analyses, the researcher noted that several interviewees also mentioned what strategies they de-

ployed to overcome the identified challenges. In line with the goals of the thesis, the researcher decided to add these strategies to the scope of the research and defined four categories and eight strategies (Table 5) from the interviews and the same triangulated data.

## 6.2 Implications

These findings have implications for both academia and business. First, a new unit of analysis has been introduced to the literature on SSBI and reintroduced to IS implementation research as a whole. The findings shed some more light on the complex concept of SSBI implementations and thereby opens the door to a lot of future research. Consulting firms play a big role in SSBI implementations. Although the observations are based on past projects, learning from the past can help overcome them in the future. By consultants understanding the challenges that they may face, hopefully the success rate of implementations, as well as the adoption of SSBI, can improve.

Where BI literature typically discusses two types of users, business users and power users, the results of this thesis seem to position the consultant as a role in between the two. That is, consultants have the technical knowledge of power users, but (in the beginning of the engagement) without an understanding of the complex data landscape like business users. As such, and like business users, they rely on power users to provide that information. The findings can help new consultants prepare for the challenges they can face during their projects, as well as give them some ideas of strategies they can deploy to overcome them.

Although many of the challenges are not unique to SSBI and are thus not new, the picture of the challenges that SSBI consultants face during implementations *is* new. Furthermore, several of these challenges are slightly different in the context of SSBI, which should be noted. The fact that many strategies are also not unique to SSBI is actually great for consultants, as that potentially means that other general consulting challenges can work in the context of SSBI as well, and potentially vice versa. The challenges and strategies not being unique also gives good hope for this study enriching insights into consulting challenges during BI implementations and ES implementations as a whole. It goes without saying that the more tools consultants can use to overcome challenges, the better.

### **6.3 Future Research**

Whether it is actually the case that other general consulting strategies can be deployed in the context of SSBI is something that warrants its own investigation. In that, researchers could specifically look for the strategies SSBI implementation consultants deploy during their projects in order to paint a more complete picture. An interesting addition to that would be researching general consulting strategies that may not yet be deployed in the context of SSBI but could work and may as such contribute to more successful SSBI implementations.

Of course, the findings of this paper should be verified with future research that answers to the limitations of this paper. It would be particularly helpful to verify the results with a larger pool of respondents of consultants as well as consultants from other firms and other cultures to rule out that these are firm- and culture-specific challenges or strategies.

Most importantly, more research should be conducted on the consultant as a unit of analysis in SSBI implementations, but also on IS implementations broadly, as this is a vastly under researched area. More research here could potentially contribute significantly to the academic understanding of the success and failures of IS implementations, as well as contribute to the consulting businesses outside of academia.

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## APPENDICES

### Appendix 1. Interview Guide

#### Interview Guide

##### General notes:

Interviews will be recorded with Microsoft Teams, even if the interview is conducted in person. This allows captions and transcripts to be generated automatically.

In addition to the Microsoft Teams transcripts, Otter.ai will be used as well. This way, whichever tool provides the most accurate transcriptions will be used. It is also a failsafe, in case one of the tool stops working – the interviews can only be conducted once.

##### Introduction

-Welcome, intro research & **topic** SSBI Implementation issues from consultant perspective

-**Clarify consultant:** not only the level consultant, business analyst is also a consultant, director is also a consultant, etc.

-**Define SSBI** + give option to ask clarification questions

-“SSBI allows casual users to access and use data as desired, enabling them to analyze data and make decisions without support from a technical BI specialist”

- “The facilities within the BI environment that enables BI users to become more self-reliant and less dependent of the IT organization.

-**Clarify SSBI Implementation:** full implementation process, from design, to build, to test, to implement, any issues

##### Context questions:

-Name

-Age

-Role/level in Deloitte

-Years of experience (in consulting, SSBI + what did you do before?)

-Industry you work in

-SSBI tools you worked with

-SSBI implementations you worked on

-Your role in said implementations

##### Topic questions:

Note to self: ask for the WHY

Sub questions based on answers

-What is the story of your experiences implementing SSBI as a consultant?

-What are the challenges you have experienced as a consultant during SSBI implementations?

**If needed:** depending on previous answers, potential other topics to bring up

-New organization/industry

-Time constraints

-Data Access/Availability

-Data Quality

-User Independence

-Low skill

-Difficult tools

- Report Creation
- Education
  - User Interest

### Closing:

Anything to add? Any question you expected, but I did not ask? Anything I should not forget?

Gratitude + next steps (send transcription and analysis, option to give feedback)

## Appendix 2. Data Management Plan

Research data management plan for students

This document will help you plan how to manage your research data. More detailed instructions for each section are available online in the [Research Data Management Guide for Students](#).

### 1. Research data

Research data refers to all the material with which the analysis and results of the research can be verified and reproduced. It may be, for example, various measurement results, data from surveys or interviews, recordings or videos, notes, software, source codes, biological samples, text samples, or collection data.

In the table below, list all the research data you use in your research. Note that the data may consist of several different types of data, so please remember to list all the different data types. List both digital and physical research data.

Research data type	Contains personal details/information*	I will gather/produce the data myself	Someone else has gathered/produced the data	Other notes
Data type 1: <i>Interviews</i>		x		Anonymised
Data type 2: <i>Interview notes</i>		x		
Data type 3: <i>triangulation posts</i>			x	

\* Personal details/information are all information based on which a person can be identified directly or indirectly, for example by connecting a specific piece of data to another, which makes identification possible. For more information about what data is considered personal go to the [Office of the Finnish Data Protection Ombudsman's website](#)

## 2. Processing personal data in research

If your data contains personal details/information, you are obliged to comply with the EU's General Data Protection Regulation (GDPR) and the Finnish Data Protection Act. For data that contains personal details, you must prepare a Data Protection Notice for your research participants and determine who is the controller for the research data.

I will prepare a Data Protection Notice\*\* and give it to the research participants before collecting data

The controller\*\* for the personal details is the student themself  the university

My data does not contain any personal data

\*\* More information at the university's intranet page, [Data Protection Guideline for Thesis Research](#)

## 3. Permissions and rights related to the use of data

Find out what permissions and rights are involved in the use of the data. Consult your thesis supervisor, if necessary. Describe the use permissions and rights for each data type. You can add more data types to the list, if necessary.

### 3.1. Self-collected data

You may need separate permissions to use the data you collect or produce, both in research and in publishing the results. If you are archiving your data, remember to ask the research participants for the necessary permissions for archiving and further use of the data. Also, find out if the repository/archive you have selected requires written permissions from the participants.

Necessary permissions and how they are acquired

Data type 1: Permission was asked verbally to interviewees for using interviews and interview notes. The data will be deleted after finishing and successfully defending the thesis.

Data type 2:

### 3.2 Data collected by someone else

Do you have the necessary permissions to use the data in your research and to publish the results? Are there copyright or licencing issues involved in the use of the data? Note, for example, that you may need permission to use the images or graphs you have found in publications.

Rights and licences related to the data

Data type 1:

Data type 2:

#### 4. Storing the data during the research process

Where will you store your data during the research process?

In the university's network drive

In the university-provided Seafile Cloud Service

Other location, please specify:  the secured company network, including the protected company MS Teams.

The university's data storage services will take care of data security and backup files automatically. If you choose to store your data somewhere other than in the services provided by the university, please specify how you will ensure data security and file backups. Remember to make sure you know every time where you are saving the edited/modified data.

If you are using a smartphone to record anything, please check in advance where the audio or video will be saved. If you are using commercial cloud services (iCloud, Dropbox, Google Drive, etc.) and your data contains personal data, make sure the information you provide in the Data Protection Notice about data migration matches your device settings. The use of commercial cloud services means the data will be transferred to third countries outside the EU.

#### 5. Documenting the data and metadata

How would you describe your research data so that even an outsider or a person unfamiliar with it will understand what the data is? How would you help yourself recall years later what your data consists of?

##### 5.1 Data documentation

Can you describe what has happened to your research data during the research process? Data documentation is essential when you try to track any changes made to the data.

To document the data, I will use:

A field/research journal

A separate document where I will record the main points of the data, such as changes made, phases of analysis, and significance of variables

A readme file linked to the data that describes the main points of the data

Other, please specify:  I clarified this in the thesis itself. All steps were discussed.



## 5.2 Data arrangement and integrity

How will you keep your data in order and intact, as well as prevent any accidental changes to it?

I will keep the original data files separate from the data I am using in the research process, so that I can always revert back to the original, if need be.

Version control: I will plan before starting the research how I will name the different data versions and I will adhere to the plan consistently.

I recognise the life span of the data from the beginning of the research and am already prepared for situations, where the data can alter unnoticed, for example while recording, transcribing, downloading, or in data conversions from one file format to another, etc.

## 5.3 Metadata

Metadata is a description of your research data. Based on metadata someone unfamiliar with your data will understand what it consists of. Metadata should include, among others, the file name, location, file size, and information about the producer of the data. Will you require metadata?

I will save my data into an archive or a repository that will take care of the metadata for me.

I will have to create the metadata myself, because the archive/repository where I am uploading the data requires it.

I will not store my data into a public archive/repository, and therefore I will not need to create any metadata.

## 6. Data after completing the research

You are responsible for the data even after the research process has ended. Make sure you will handle the data according to the agreements you have made. The university recommends a general retention period of five (5) years, with an exception for medical research data, where the retention period is 15 years. Personal data can only be stored as long as it is necessary. If you have agreed to destroy the data after a set time period, you are responsible for destroying the data, even if you no longer are a student at the university. Likewise, when using the university's online storage services, destroying the data is your responsibility.

What happens to your research data, when the research is completed?

I will destroy all data immediately after completion, because: of the confidential nature and promise of anonymity. The successful defence of my thesis will also mean the termination of this research and thus the data will not have to be used anymore.

Remember to keep the data management plan updated throughout the research project.