

Self-Service Business Intelligence success factors that create value for business

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Abstract

Business Intelligence and Analytics have change the business needs, but the market requires a more data- driven decision-making environment. Self-service Business Intelligence initiatives are providing more competitive advantages currently. The role of the users and freedom of access is one of the essential advantages that SSBI holds. Despite this fact, there is still needed analysis on how business can gain more value from SSBI, based on the technological, operational and organizational aspects. The work in this paper serves to analysis on the SSBI requirements that bring value to business. The paper is organized starting from building knowledge by upon the existing literature and exploring the domain. Data will be collected by interviewing experts of the fields. The main findings will provide future suggestion related to the topic and the results will serve both the companies that have implemented it and the ones that want to see it as a perspective in the future.

Keywords: SSBI, BI, Big Data, Analytics, key requirements

1. Introduction

Business is operating in an analytics-driven environment where there is a need for data-based decisions made from the employees (Daradkeh & Al-Dwairi, 2017; Passlick, et al., 2020). Using Information Technology in many different aspects including fast response on the market, having a governed information and being ‘smarter’, brings value to the business. Demirkan and Delen (2013) highlight that service-oriented thinking is one of the fastest growing paradigms in IT and has a major impact in information systems. Checkland and Howell (cited in Demirkan & Delen, 2013, p.413) claim that “...a consequence of the nature of the process, in which intentions are formed and purposeful action are undertaken by people who are supported by information, is that ‘information system’ has to be seen as a service system: one which serves those taking the action.” One of the emerging innovations of IT is SSBI. SSBI systems provide new potentials for companies due to the advantages that they hold. Since SSBI systems main aim is to enhance traditional BI, the pros of this approach stated by Alpar & Schulz (2016) include: gaining of new competitive advantage by making more data- driven decisions, helping IT department with the ‘weight’ of responsibility and having a more governed information.

The exploration of SSBI is done in several approaches by researchers which can be categorized as technological and operational. Daradkeh and Al-Dwairi (2017), investigates the users of a SSBI business environment in order to understand the maturity level that they have towards the tools they use and their level of acceptance in this setting. In the report of Imhoff & White (2011), there are given a set of recommendations to technical and business professionals to understand the environment, its advantages and challenges so they can help in making a more critical approach in their SSBI perspective. Most of the knowledge generated by the literatures are focused on the general features of SSBI, leaving a lack of understanding in how the approach is made inside an organization and its operations. In addition, some of the provided literature reviews upon this issue mainly rely on the discussion about the architectures of SSBI applications.

Even though SSBI is becoming a trending approach, it contains challenges related to its implementation and its whole functionality. “It’s not a one -size-fits-all program” (Eckerson, 2012, p. 2) . There should be provided a thoughtful analysis upon the success factors of SSBI, its influence, challenges in companies that have implemented it and also the companies that want to implement it. Further understanding on SSBI need to be conducted.

Lennerholt , et al. (2018) consider the main aim of SSBI to be the establishment of a BI system which will function in decision making without the need of ‘power users’. They further discuss the main challenges that the implementation of SSBI brings and categorize them into two fundamental groups:

1) access and use of data and 2) self-reliant users. Despite the detailed analysis and literature review, still there is argued that the research in the SSBI issue is scarce. In addition, the challenges identified should be validated and interpreted. The findings of this paper will be useful also for companies that have not implemented any big data analytical tools and SSBI system and want to use it to improve their business needs.

The purpose and focus of this work will be in trying to find the success factors and analyze the requirements for SSBI. Since, several researchers try to provide challenges that come along with SSBI, there is needed an

understanding of the SSBI environment. Lennerholt, et al. (2018, p. 5062) cite that “SSBI is not just a software to install”. Even though some analysis are done related to SSBI, still there is needed further research to validate challenges found and find if there are new ones based on the patterns studied. A conceptual model or a framework should be provided based on the results of the study. The right research question that will be asked in this paper is:

1. What are the key requirements for self-service business intelligence in order to create business value?

In addition to this main question, there is generated another question related to the companies that have not implemented a BI solution yet which will be better brought up in addition to the main issue as part of the discussion section:

- 1.1 How SSBI can be approached in organizations that have not implemented a BI solution?

2. Self-service BI

2.1 SSBI - technological aspect

In the technological context the concept of data quality is a very important. Data quality is the capability of data to satisfy needs under certain conditions, provide various services for an organization to reach top services (Taleb, et al., 2016; Panahy, et al., 2014). The dimensions of data quality serve for better classification of the information, so it becomes more valid and goes through a unified process for the company (Sidi, et al., 2012). The important parts of these dimensions include: consistency – the data is in the same format, accuracy – data is accurate when it is saved and has real value, uniqueness – data cannot be mistaken, validity – data is in the right format so the right information can be conveyed, completeness – the availability of data to be used and timeliness – the extent to which data is appropriated for the task (Sidi, et al., 2012).

Data governance is the other challenge that is listed in the Table 1 below. It is also related with the data quality concept. Riggins and Klamm (2017) define data governance as an enforcement of the policies for the operational technical personnel. In this way it provides the data to right people when they need it, to make the right decisions. Even though Stodder (2015) argue that governance issue is more related to IT as a responsibility, when it comes to SSBI, it is not regarded the same anymore. Instead, it is strongly related to security, privacy and because the amount of users accessing the information increases, then governance is also affected. The role of IT is to provide governance for all users. (Stodder, 2015)

2.2 Digital capability (organizational context)

While understanding the concept of SSBI as a facility then the question raised is how do organizations find it currently?

Generally companies do not have this idea of SSBI widespread and Logi Analytics, 2015 (cited in Alpar & Schulz, 2016, p.154) predicted that approximately 22% of potential users put it into practice and some of them report failures. In this case, there should be understood what are precisely the business needs and specifications that make them apply self-service business intelligence.

Businesses are reliant on analytics because it makes them more efficient and increases their productivity. What they tend to analyze the most are transaction and demographic information, customer behavior, sales and marketing efforts. Many companies have positions such as Data Analysts/Scientists, but the necessity has made the organizations require self-service analytics tools. This form of adoption make people of a company perform their role of expertise (ex. Product Manager) while doing analytics for certain purposes. (Convertino & Echenique, 2017)

Users of a BI environment are significant, but sometimes there are some ineffectivenesses that occur due to limited BI. Stodder (2015, p.11) mentions that “Self-service tools allow us to take different pieces of data from different sources that we’re trying to analyze and put them together without being confined to defined elements and just one particular data model.” In addition, with self-service support it is easier for managers to and executives to get the insights without IT interference. In Bani-Hani et al., (2018) it is indicated that there are five main attributes that lead towards the success of self-service technologies (SST): co-production, autonomy, ease of use, control and trust. Their characteristics and explanation are summarized in the figure 1 below:

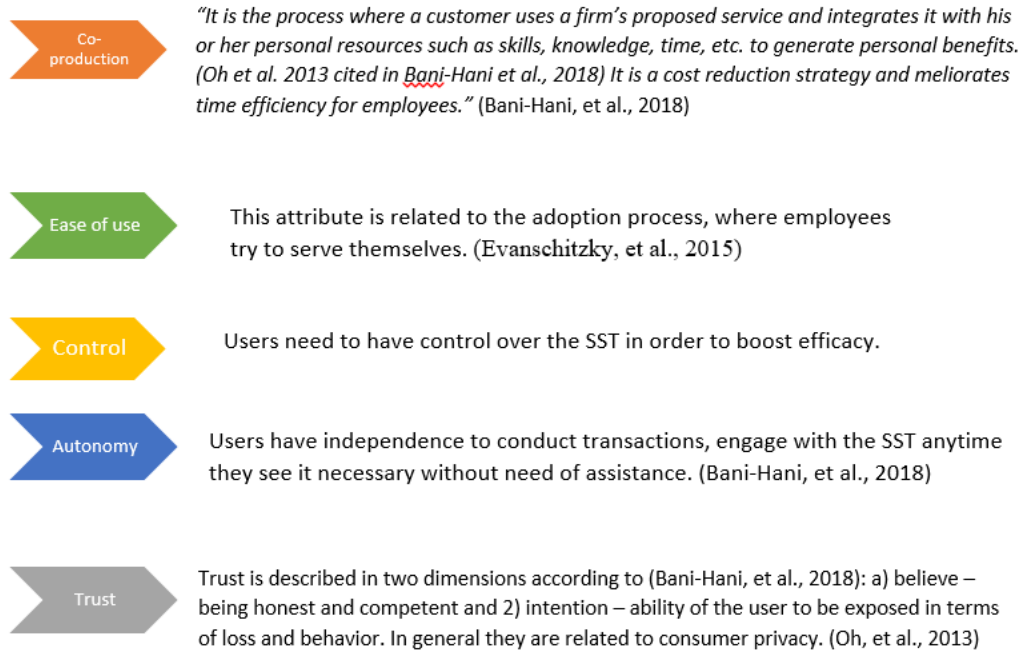


Figure 1. Explanation for SST attributes (author's work)

Several authors discuss about the dimensions of self-service BI, which create an overview of a model framework for the issue. Passlick et al. (2017) discuss the technological aspect of SSBI, and result that there is a need for the semantic layer. Semantic layer is an architectural element, which is designed to connect different data sources and provide a unified access. There are five dimensions of SSBI identified: technology, data presentation, social feature and overall requirements (Passlick, et al., 2020). The previous mentioned elements lead to business value for better decisions, collaboration (data driven communication) and business integration. Table 1 below will give a summary of features of self-service BI along with challenges and benefits.

Advantages	Challenges
Flexibility	Difficult to scale
Software architecture	Data governance and integration. (Imhoff & White, 2011)
Saves resources (Lennerholt , et al., 2018)	User uncertainty (Weiler , et al., 2019)
Facilitates the access data	Access of source data to business users (Alpar & Schulz, 2016)

Improves decision making, agility and efficiency(Schlesinger & Rahman, 2015; Lizotte-Latendresse & Beauregard, 2018; Alpar & Schulz, 2016)	Business users lack the needed skills when using SSBI tools. (Johannessen & Fuglseth, 2016)
Less dependency on the IT department (Alpar & Schulz, 2016)	Implementation challenges (Lennerholt , et al., 2018)
Supports BI/big data analytics (Passlick, et al., 2017)	Lack in training (Weiler , et al., 2019)

Table 1. Summary of advantages and challenges of SSBI (author's work)

3. Methodology

3.1 Research Approach

As Klein & Myers (1999) state, there are two main sources for the set of principles in evaluating the interpretative research: the practice of anthropological research and understanding of the philosophy of the phenomenon and hermeneutics. The one that will be followed in this thesis is the hermeneutics nature. As the author describes, the hermeneutics philosophy revolves around a circle, which helps in broadening the nature of IT and have better interpretative outcomes. The main aim of this research is to explain the SSBI as a phenomenon in organizations and as an emerging field in our era. In this case, the most suitable approach is the qualitative method. However there should not be a misunderstanding that the interpretative research is interchangeable with the qualitative. Chua (1986, cited in Klein & Myers, 1999, p. 69) classifies the research into three main epistemologies: positivist, interpretive and critical. Following this, the qualitative research can be conducted in all of the perspectives mentioned before. The aim is to gain a deep understanding of the social-technological setting and interact with the participants of the environment.

SSBI is a phenomenon which needs to be studied by a combination of systematic literature review, in order to provide a deep understanding of the phenomenon, description of the settings and environment and reaching to the gap that still exists and needs to be completed. In order to fill this gap, an investigation should be conducted, so additionally the human aspect is really important. That is the reason why the qualitative approach will be considered and as Creswell & Creswell (2018) states, the understanding of the participants' point of view is essential while doing the research. In order to do a proper analysis there is also needed the researcher's involvement (Walsham, 2006). The role that the researcher has, is to put together the phenomenon through a consistent analysis and participants' point of view, and at the same time building knowledge in that area of study, based on interpretation, which according to Walsham (2006) may require the researcher to be an outsider, involved or neutral one.

3.2 Methods for data collection

This section will provide information about the data collections used for the study. Qualitative research includes several data collection methods such as interviews, documents and observations (Creswell & Creswell, 2018). In this thesis semi-structured interviews will be the main data collection instruments. Interviews are an essential method of data collection, when the researcher aims to seek a better understanding of the specific phenomenon. That is the reason why the primary source of data collection will be the interviews. The interviews will be conducted with the participation of specialists in the SSBI and BI domain and who also work at different positions and departments. The selection of these participants is based only on the fact that they have knowledge and experience with BI and SSBI environment. The duration of the interviews will not be conducted in a long term scope, but are weekly held, within a time span of 2 months. The structure of the interviews is: introduction by explaining the description of the scope of analysis, confidentiality and ethical issues, interviewing process. As the researcher in this process, a neutral position will be held by not participating. The interview is organized in four main sections: 1) introductory – to know about the interviewee background, 2 – BI context – to build knowledge upon the current BI environment functionalities and challenges, 3) SSBI context – includes questions about the future and recommendations. The SSBI section is divided into two main sub-sections: technological and organizational aspect. In order to conduct the interviews in the proper way, there is presented a form of giving consent to participate in the process and also record them. The recordings are only audio based and in addition to them some notes are taken to keep the track. The participants in this process are: 1) Head of BI (Company A), 2) Team Leader for data extraction and analysis (Company A), 3) CEO (Company B), 4) System Administrator (Company C), 5) Senior Specialist (Company C), 6) Officer in BI and MIS department (Company D).

3.3 Methods for data analysis

Since the thesis is following a qualitative approach, then thematic analysis will be conducted. Data analysis will be carried on the interviews. Braun & Clarke (2006) discuss about the relations between the questions of a qualitative research. They discuss that the questions should not be too broad, but instead narrowed down and eventually those narrow questions bring the big picture.

In order to conduct an efficient data analysis on the interviews, basic coding technique will help, since it provides identification for the topic of SSBI and is valuable when organizing the information. The data analysis from the transcripts of the interviews is going to be categorized in relevance to the 3 main aspects: technological context, organizational and decision making. The process of analysis is classified as an inductive and iterative process. Knowledge will be gained which will be further used in reasoning to make broader generalizations from the data. Another important data analysis method that will be used is data condensation. Elo and Kyngas (2007) state that in order to attain a broad description of the phenomenon then content analysis is the best research approach. In this thesis the

condensation will help in the process of selecting, simplifying and also transforming of the data from the interviews. The aim is to reach a good content analysis. Elo and Kyngas (2007) describe content analysis as a process which is both inductive and deductive. Since this thesis approaches more the inductive method, then the processes that describe it are: preparation, organizing and reporting (Elo & Kyngas, 2007). The analysis done in the upcoming chapters based on all the methods mentioned above, will come into certain forms of visualization: tables, graphs and figures. Furthermore the analysis process is also based on the systematic literature review done in the second chapter. It is important to make a comparison in the analysis between the experts and literature in order to reach the best conclusions.

3.4 Validity and reliability

Reliability is related to the consistency of data. Hernon & Schwartz (2009) discuss 3 ways of estimating reliability: internal consistency, pretest, test and retest. In this thesis, internal consistency will be approached since it investigates the phenomenon through two different set of questions on BI and SSBI aspect and analyze the correlation between them. The two different set of questions belong to the group of participants that have implemented SSBI in their organizations and the other one are the companies which have no experience with SSBI. To provide the proper reliability to this research then first the analysis from the literature review was conducted and the information that will be collected from the interviews will be analyzed in the findings chapter.

Validity refers to the generalization of the findings of the study. According to Hernon & Schwartz (2009) validity can be seen in different aspects: external validity, internal validity or other aspects. In this thesis external validity, which relates to the explanation whether the findings can be generalized, will be achieved by interviewing the different people and set of groups previously described in the paragraph above. To reach the internal validity, which refers to the match of theory and observations, the literature review together with the findings gathered from the interviews will be discussed in the other chapters.

3.5 Ethical considerations

Ethics is related with the proper and right way of conducting a research. In this thesis, integrity of the participants is the first priority, so there will not be any ethical concern towards confidentiality. The transcription of the interview will be completed in accordance with the consent of the participants. There will not be experienced any violation about scientific misconduct. There is presented a form of consent to participants of the interview. The information that will be gathered is not sensitive and revealing information therefore there was not needed a real non-disclosure agreement (NDA). In addition, the participants in the process are anonymous and this is an important part to not violate their identity and privacy which is mentioned in the form of consent. The form of questions are based on the topic and there is no form of revealing any information about their private life. Another important point which is taken in consideration in this thesis is the transparency. The transcripts were sent to the participants who wished to have them and in addition the transcripts will not be available in the Appendix due to the rejection of participants. They gave their consent in using the information but not making public the whole interview process. The audio materials will also be very discrete and available to the person working in the thesis.

4. Empirical Findings and Analysis

4.1 The current BI environment

Based on the evaluation of the answers for the BI environment, it could be assessed that the usage of BI is generating the reports in order to gain insights from the data and use them in several main departments inside the organizations to reach the operations and serve the main management objectives. In order to create better value, decisions and do them in a faster way, there is needed more analytics. As described in the second chapter in this paper, analytics is about getting value from the data, owing of the fact that factual decisions have to be based and proven in real data, so they can be objective and more accurate. Eventually, the BI environment needs a more innovative solution to approach the needs for creating better value within the organization. Self-service business intelligence comes as a crucial impacting factor in the BI setting. The need of shifting to SSBI is growing rapidly and it is becoming a real valuable necessity. In pursuance of the main research question of this thesis, now that evaluation of BI environment is accomplished, then an evaluation of SSBI needs to be done. To analyze the findings for the SSBI environment, the experts participating in the interview process were categorized in two groups: a) company applies SSBI and b) company does not apply SSBI. The findings will be presented in the next 4.2 subchapter.

4.2 SSBI - technological aspect

Data quality is a concerning problem in BI environment, yet it is present in SSBI again. Imhoff and White (2011) emphasize that it is not just about installing a software, but a solid infrastructure is needed which is essential in

planning & design, data quality, data models for data warehouse and scalable databases. The BI officer considers data quality to be an existing challenge in SSBI that eventually comes of having all data sources in one source and controlling data distribution. The CEO also accentuates that data quality is considered as the number one blocker, which is in relationship with data governance. The dimensions of data quality discussed by (Sidi, et al., 2012): consistency, accuracy, uniqueness, validity, completeness and timeliness are also discussed by the respondents. The team leader phrases that *"...if it presents a number and we have a definition of what it means and the others have other definition of what that is, then some decisions could be made based on wrong definitions and that is scary."* The definition in this case is related to the dimension of validity, accuracy which again is in relation with uniqueness and also with completeness. Considering the process that the Head of BI described: 1) gathering data from different data sources, 2) preparation (including here data cleaning, processing), 3) analysis (including here analytics, BD analytics), 4) visualization and 5) interpretation for decision-making to create real value from data, SSBI environment leads to a better data quality setting. Comparing the challenges emphasized in the BI environment, service-oriented thinking is a growing phenomenon. It does not implicitly mean that moving towards service-oriented thinking data quality is great, instead data quality tends to be improving by SSBI tools. As all the participants highlight, more analytics is done on data, hence data quality improves only if this new advanced medium is well established and BI is very consolidated.

Data governance is another blocking issue in BI which was previously raised as a challenge by the experts and it is extended to SSBI too. When talking about data quality and its dimensions, it can be implied that there is relation between them obviously. As interviewees assert, data governance is about controlling of the data which denotes secure, consistent and available data. Data governance constitutes a strategy for the company, which is necessary in making business decisions (System Administrator, Senior Specialist). Each of the three mentioned concepts above, can be further analyzed in the SSBI context, because each one has its impact in governance.

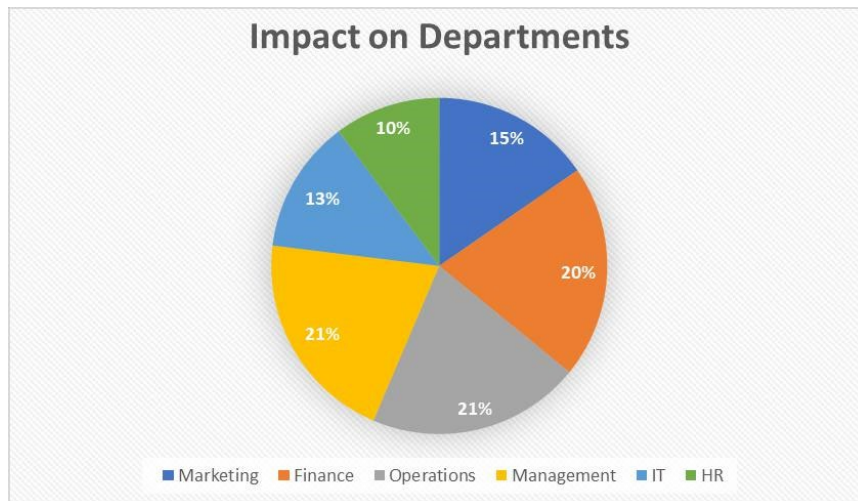
When arguing if data is more secured in SSBI, the team leader elaborated that: *"The most secure system in the world is the one that has no users. But that's not useful. So if there is data security then it is not bad to let everyone know how the data/values are coming and use them.Actually, not everyone should know it. You should have levels of confidence of what should each employee use and also trust them that they won't misuse it. Because data enables in making better decisions more than analyzing teams. People have different viewpoints then you get more eyes. Not all people are data security friendly."* In addition, the BI officer stated that data is more secured and governed when information is centralized in a specified unit, *"but knowing that SSBI allows user to interact with data without changing them gives security, even though thinking that it can be shared to anyone is challenging"*.

All the experts interviewed agree that having a large group of people accessing the information is not secure. The need for more control together with the other reasons analyzed led to SSBI, so security was still not sufficient in the previous environment and all the experts assert in this point. The head of BI mentioned that in their company security as a very sensitive topic was kind of in the same phase as it was previously, with not a lot of change but still she mentioned that in their current phase they were pleased with the security politics that they had, but when moving to the future and further develop in their SSBI environment, then at that point they will need to take care of maybe some changes in their security politics. Generally the interviewees agree that data is more governed with SSBI, but there are still some inhibitors that block data for being 100% governed.

4.3 SSBI Operational aspect

SSBI environment helps in the operational level for better decision-making, improving the effectiveness and efficiency. The interviewees mention that in SSBI setting it is important the users (employees) can have equally access of the information and the extend of BI in this phase is crucial for the tasks that are performed. Describing the main users of SSBI, the answers do not differ that much but are based in the size of the company. The CEO, who is part of an organization with less than 250 employees appointed the managers as the main users. Meanwhile, the rest of the experts claimed that generally controllers are the main users of SSBI including here: economic controllers, financial officers and as the team leaders describes: *"It is more of the head of the departments, then everyone in the company."* In addition, the BI officer states that even though in her company they do not apply SSBI, the main users are the colleagues in the business department, because they need it more for decision-making and making predictions. It is important that she noted that the role of the BI members is to support them.

SSBI has different levels of importance based on the departments inside a company. As the number of departments increases with the growth of the company, in this analysis there will be covered the impact of SSBI in 7 departments. The departments have been rated by the interviewees on a scale from 1 to 3 where: 1 – low impact, 2 – medium impact, 3 – high impact. The percentage of the impact for each department is shown in the graph 1 below.



Graph 1. Impact of SSBI on the departments (author's work)

What the team leader sees as a sensitive issue is the security part and the definition of the issues. He explains that it is a common sense of basing results in opinions and interpretations and that is not the way to start from: *"People usually use to say that make your data prove me right, instead it should be all the way around. You start from data in order to reach the result, eventually making data driven decisions."* This explanation is also linked with the definition of things. In order to reach a specific result then everybody should have a description of what things mean, so the definitions are the same and the result is perceived in the same way and is understandable. The system administrator and the senior specialist highlight that in their case the challenges were more related to the training of the staff, but that could be solved with not too much effort if the BI environment is well established: *"Training is important for the user uncertainty that may come from the lack of knowledge. It is the responsibility of the managers to be able to equally distribute the needed knowledge for SSBI between the users."* The knowledge that they talk about is both some technical/functional one related to the usage of the tools and also introduction about the importance of SSBI in their daily tasks and the help in decision making. But as they further highlight this issue is not too much time consuming because the tools are user friendly, so they do not require too much effort in the IT context.

4.4 Companies that do not apply SSBI

SSBI is considered as a success factor for the decision-making environment and all the interviewees agree that it is a must in business. Despite this fact there are still companies that have not yet applied self-service BI and there are reasons why they operate like that. The system administrator takes in consideration the example of companies that are more reluctant in applying it, due to the lack of the maturity level of analytics in their business. In addition, the team leader adds that another reason for not applying SSBI is because the BI environment of some companies is not well founded and that makes it harder for those companies to go the SSBI route.

The BI officer works in a bank, where BI environment is well established but they have not applied SSBI yet. She notes that the reason for the current situation is the time taken to reach a good satisfactory BI environment and lacking of the effort to shift to SSBI. Still, she believes that they are not far from applying SSBI: *"...in a corporate like us it would be better to implement it. I think it will help more on strategic decision-making."* Following this issue, the users need tools for more personalized actions: reports, visualizations, query performing and eventually more analytics which is so important in decision-making environment. This case above actually is the example of a company with current BI environment, but how does the situation change in a company where BI is not well established yet?

In the case of a company where the BI does not have a good foundation it is harder for SSBI to be directly applied, the challenges would be harder to deal with. The team leader believes that: *"If you don't have BI at all, or just 1 or 2 person know how the data is extracted and goes on, then it is hard. They have to have a BI foundation before they go SSBI route. But I can't say to what degree they must have a consolidated working BI environment before they start employ self-service."* Furthermore, the team leader states that BI is important in having economic control and some other insights that are truly needed. The BI foundation has a major impact in expanding to SSBI and all the interviewees agree. Even though the ease of SSBI is that the users do not have to be experts in statistics and analytics, so they can perform the operations they want, what traditional BI does is that it creates a bridge of collaboration between the users and IT. This cooperation needs to exist, because there needs to be an understanding and a good workflow in the company. The system administrator and the senior specialist agree that it is hard to have a coexistence of BI and SSBI: *"...SSBI environment maybe can be created without BI, but you need to have previous analytics environment and also*

a BI team that knows about the ETL process, which is important.” The BI officer highlights that SSBI is not a substitution for the BI, because there are data warehouses which are important and also other BI tools that are needed. In this context SSBI tools come as a supplement of the current BI environment and are regarded as facilitators.

5. Discussion

What it was mostly concluded is that there was needed more independence of the users and not too much dependence on the IT department. As it is also stated by Imhoff & White (2011) SSBI makes it easier to access the data sources, hence making BI tools easier to use. This is also confirmed by the interviewees, who agree that the independence of the users is the good part of SSBI and creating a relief for IT. Another important point to consider is the usage of analytics. It is discussed in the literature review that analytics is a very important part that is needed for value creation in a company. The problem in BI is that analytics and analysis of the aftermath are the responsibility of the data scientists, analysts and BI users. Regardless of this, with SSBI the success comes with the interaction of more users, which is supported also by the experts. In the empirical findings it was generally inferred that controllers are mostly the users of SSBI.

One important factor which affects the SSBI environment is the staff training. Weiler et al. (2019) argue that there are no standardized training programs for SSBI. This is also supported by the experts, which is presented in the empirical findings. This issue is not regarded as a top inhibitor, instead it is discussed by the experts that some training is necessary to be done when the users start using the tools because it is related with the user uncertainty.

The users of SSBI defined by Alpar & Schulz (2016) and (Phillips-Wren, et al., 2015) are the business and power users (data analysts/scientists). In the empirical findings the controllers, including here economic controllers, financial controllers and then the other users in the company are regarded as the main users of SSBI. In this context they could be categorized in two groups: the one that are more oriented in analytics and have a BI background and the users who are in the position of end-users, meaning that they are not specialists in analytics. Despite not being specialists in analytics, SSBI does the analytics by itself, hence end users can more easily use the tools and become more independent, get more insights on data and doing all the handling and manipulation of data by themselves. This goes in hand with the independency from the IT department that is discussed in the empirical findings. According to the interviewees the non-dependency on IT is one of the main advantages of SSBI, which is also supported by the literature. What is added by the experts is the fact that the relation between IT and SSBI has not disappear entirely. Instead, it is still needed because there are certain activities that IT carries, which serve as a support for SSBI users.

An issue that is crucial and mentioned both in the literature review and the empirical findings is the data governance. In chapter 4, it was discussed that BI did not offer a good data governance, despite moving to SSBI, data governance still remains an important and challenging issue. Providing the right data to the right people is not easy. It is an essential generator for the data quality, security and as described by the Riggins & Klamm (2017) it is related to technology, people and processes. In the literature review, the concept of data governance is more analyzed in the context of challenges that it initiates if data is not governed in the right way. In addition, it is mentioned by different authors that governance is a success factor for SSBI. From the empirical findings, this concept is put in a broader perspective, in how it helps in creating value. The focus of the interviewees was in certain parts. The team leader argues that security is a crucial issue, which has an increasing importance as data becomes more accessible by users. The CEO on the other hand, argues that data quality is a blocking issue and he regards the linkage of data security and governance as very impacting. What comes as a suggestion by all the parts is that there should be set levels of confidence between the users and the data that is accessed. Furthermore, as it can be implied by both the literature and findings, data governance can be improved at some sort of level by decreasing the user uncertainty. The more the user has knowledge about the tool and ‘knows the power in his hands’, then the security can be at a better state. In addition to the governance issue there is the usage of internal and external data. In the literature review, there is evaluated the big data phenomenon, its importance and how it relates with analytics within a company. As it is evaluated in this paper, access rights and some levels of confidence are necessary in order to not have security breaches. Another factor which is mentioned in the literature review is the cloud analytics. SSBI in cloud is more efficient, agile and competitive. The experts, during the interview did not elaborate on this topic. Actually two of the interviewees worked in an environment where all the services were cloud based, despite that they did not mention any distinction on it. This may come as a result that cloud technologies are becoming a necessity in today world and especially in well developed countries. In all, it can be evaluated that cloud is a good solution in the technological aspect that solves a lot of issues and improves resources management. Big data analytics relies on cloud for enabling better governance on the information generating in a company.

One of the main contributions of this paper, is how companies can create value by using SSBI. It was discussed in the literature review that making BI results easier to enhance and consume (Imhoff & White, 2011) is one of the objectives of SSBI. This is supported also by the experts who highlight that the creation of a more data driven

environment is what boosts the business operations. In this work there is presented the effect of SSBI in main departments of a company, which is lacking in the literature review. As a results from the findings, finance, operations and management were the most highly affected by SSBI. The outcome comes differ from the size of a company and also the focus, but for the second one, finance is regarded as the department that shows the real situation of a company, gives the true insights, data and is valuable for making future predictions and planning of the next steps. The department less affected is HR. This department is evaluated as holding sensitive information about employees which should not be accessed by everyone in the company, but by the ones that are in a higher position in the hierarchy. Again, this evaluation depends on the size of a company, where a big sized one needs for certain reasons and evaluations which are argued in the empirical findings. Each evaluation of SSBI in certain departments, displays how each specific department uses SSBI for its own benefits, which are counted as value for the whole company. It can be stated that the organizational structure of a company affect the level of usage of SSBI.

In this analysis, the second research question that has to be answered is the effect of SSBI in companies that do not apply it. In the literature review it is generally discussed SSBI as a phenomenon and Imhoff and White (2011) present a form of report which serves as a guide for business professional and informing them about the new trends of business intelligence. Since the information from the second chapter related to this issue is not elaborated to a considerable extent, from the empirical findings it can be concluded that the two directions that this research question takes are: having a previous BI environment and not having BI at all. In the first scenario, it is evaluated that when moving to SSBI, there is needed a form of training related to the staff and preparation in the technological, operational and organizational context. Even though the CEO believes that SSBI does not change the user's mindset, training remains an important factor. Then, related to the business needs and goals choosing the right tool depends on the time, resources, approach and investment.

The second scenario, from the empirical findings is evaluated to be the more difficult compared to the first one. The experts agree that there is needed some sort of BI foundation in the company. BI is important because it helps in understanding the business logic, ETL (Extract Transform Load) process, creates foundation through data warehouses, creates valuable reports which depict the steps of company's operations. BI is especially important to data analysts and scientist as they perform all these reports and generate the right insight of data. Without BI at all it is hard for a company to know its way and leading towards SSBI directly, is needed a much greater effort and it may be also time consuming. Despite this fact, it is not for sure how it will affect for sure, because when a case of a startup company or another case is not taken into consideration in this study, so further information could have been generated.

Related to the future of SSBI, it is not hard to say that its journey has not just started, but it is evolving more. SSBI in cloud can be the next move for companies. Experts state that SSBI is a phenomenon happening now and it is essential in a mass that all companies should start to use it. It is important in creating the competitive advantage and being in the market for a long time. But as some experts convey, SSBI is not the edge of BI because there are also areas that are essential and help in value creation such as co-operational BI.

6. Conclusion

SSBI is becoming a trending innovation for the current business environment. The purpose of this paper was to study the SSBI environment and how companies generate value from it. Additionally to the research question, a sub-question needs also an answer: "how the results can be approached in organizations that have not implemented a BI solution yet". In the literature review there were found some gaps related to the deep understanding of the SSBI technological, operational and organizational context in a more qualitative approach.

To give answer to the research question a literature review was conducted for BI and SSBI environment. In order to reach SSBI, it was important to understand the current BI environment's challenges, then continue with the analysis in the SSBI setting. The study from the literature review led to certain advantages and challenges for companies that applied it. BI showed to not provide more data driven decisions for the users, hence bringing a lack of user independence. In this context SSBI was a more beneficial approach.

Based on the categorization of the three main aspects taken into consideration, the results of the study showed that SSBI is very important in supporting the business needs. It affects all a company's departments. Decision-making environment can be improved because of the decreasing of uncertainty. End users of SSBI are able to use the data independently and make better decisions for their actions. In order to succeed with SSBI in the operational and organizational level, the level of confidence is essential towards the users who hold the main position in the relation to SSBI tools. On the technological perspective, data governance is the only issue which is improved by SSBI, but there are still open issues such as data security in which a company needs to focus more, so better data quality can be provided. As conclusions to other companies who do not have SSBI environment implemented yet the factors they should be aware of are: the business needs, having a good foundation of BI environment so they

know the path of the data in their operations and also time and resources. SSBI can be regarded as a necessity for the market which generates great values for business.

Future Research

The results of this study can be valuable for companies and future studies that want to explore the SSBI environment more and how is its current condition. For future research the recommendations for companies that apply it and those which do not, are not that different. The distinction is that, for the companies which already have a SSBI environment implemented, there should be a better exploration about their journey on a more quantitative approach. This paper offers more a qualitative point of view, so future studies can provide more analytics. In addition, a concept which is mentioned in the work is the SSBI in cloud, which is not developed as a separate section, so it is also possible for other studies to include analysis for this topic by taking into consideration the main characteristics of cloud computing. This work offers also analysis for companies which have not implemented SSBI yet, but for future researches it is also proposed to do a case study upon those recommendations given in this work.

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Appendix: Protocol for the interview

Introduction

Dear contact person,

My name is Jonida Sinaj and I am doing a master thesis at Linnaeus University, Sweden. I am conducting a research about Self-Service Business Intelligence and the way in which it brings value to the business. Self-Service BI is one of the raising trends in the digital era. It has become a key feature in enhancing the business operations and helping in the marketing and management processes too. Through self-service BI business professionals can extract very useful information related to their users and operations, without needing the help of IT. Following this issue, it is of great importance to know how this process can be implemented and how can companies gain value from it. With this research my thesis aims to add more knowledge to the SSBI environment.

Recording:

During this interview the audio communications will be recorded via audio recording devices. Does this create any concern to you? If yes: Thank you, please let me know if there is anything you don't want to keep on record, or if at any point that you want to end the recording of audio. If no: Thank you for your information. This interview, will be recorded using text editing software on a computer and transcribed later on.

The transcripts of the interviews in this study will be anonymized, if there are not any objections to this. Do you give your consent to this anonymization?

Yes: Thank you, let me know if there is any detail that you would like to share.

No: Let me know if there is any information you would like to anonymize.

I _____ give consent for Jonida Sinaj to use the information collected in this interview for her master thesis in information systems.

Interview Questions

Group 1 – General

- What is your position in the company?

- How long have you worked in the BI?

Group 2 – BI context

- What is most critical aspect related to data in your company?
- What is the importance of BI in your company?
- What is the most challenging part that you face in BI environment?
- Which department/branch has more necessity in your company for BI support?

Group 3 – SSBI (Self-Service Business Intelligence)

- Does your company apply SSBI?
- How do companies enable SSBI environment? Which is the most important factor?
- Which SSBI tool do you use?
- Do you have this tool integrated in your systems or you use external resources?

- What do you consider to be the most problematic aspect that makes you want to expand to SSBI?

- Is data more secured and governed with SSBI?
- What do you consider to be a challenge related to data in SSBI context?
- What is the main advantage that the tool you use has, compared to other ones?
- What does the IT department need to do to the extension of SSBI and to use the tools O Part

2 – Operational aspect

- What issues do you face in the implementation of SSBI?
- Who are the main users of SSBI system?
- How does SSBI change the flow of the normal process that the user does in a BI environment?
- How do you find it in fulfilling the needs of the users?
- How does SSBI affect the users comparing it to BI?
- Since SSBI tends to help the IT department in not holding the ‘burden’ of dealing with multiple tasks related to data, do you consider this to be an issue and to which extent?
- How does SSBI help in operational decision-making?
- How successful do you find SSBI to be?
- In your point of view, is the co-operation between a company that uses SSBI and its partner companies that do not use SSBI affected? If yes, in which aspect?
- On a scale from 1 to 3 (low-medium-high) how will you consider the effect of SSBI in each of the following departments: Marketing, Finance, Operations management, Human Resource, and IT?
- What are the main risks of SSBI?
- What do you consider to be the main success factor of SSBI in the organizational context?
- What do you think it is too critical for other companies to apply SSBI to their business?

Group 4 – Closing questions

- Do you have any recommendations for future improvements?
- How can the companies that have not applied SSBI yet enable it?
- Do you strongly consider SSBI to be the next generation of BI?
- Is there any other thing that you would like to elaborate related to this topic?