



# Business Intelligence – its impact on the decision-making process at higher education institutions

A case study at Karlstad University

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Business Intelligence – dess påverkan på  
beslutsprocessen vid högskolor  
En fallstudie på Karlstads Universitet

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2017-06-08

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Issue: 1

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## **Abstract**

The purpose of this thesis is to understand how Business Intelligence (BI) influences the decision-making process (DMP) at higher education institutions (HEIs). Furthermore, this study aims to identify success factors of BI adoption (gathered from previous research) that are difficult for HEIs to fulfill. The study applied a qualitative research strategy and was conducted as a single case study at Karlstad University (KaU), a Swedish public HEI with approximately 16 000 enrolled undergraduate students and 1 200 employees. Regarding the data collection process, empirical data was collected through eight semi-structured interviews, all held with users of KaU's BI tool. The thesis' findings show that BI affects the DMP at HEIs by increasing the *quality of information*, *reducing time*, and *increasing the efficiency* for the user. The findings also show that for a HEI, most key components that increase an organization's chance of a successful BI implementation are difficult to fulfill completely. Three components were identified to be in greater need of improvement than the rest: *management & leadership commitment*, *culture around use of information and analytics*, and *requisite resources*.

## **Keywords**

Business Intelligence, decision-making process, higher education institutions, universities, impact, influence, success factors, key components, adoption, implementation

## Sammanfattning

Syftet med denna studie är att förstå hur Business Intelligence (BI) påverkar beslutsprocessen vid högskolor. Vidare, strävar denna studie efter att identifiera framgångsfaktorer för BI-implementering (samlade från tidigare forskning) som är svåra för högskolor att uppfylla. Studien tillämpade en kvalitativ forskningsstrategi och genomfördes som en fallstudie vid Karlstads Universitet (KaU), ett svenskt statligt universitet med ungefär 16 000 studenter och 1 200 anställda. När det gäller datainsamlingsprocessen, samlades empirisk data in genom åtta semi-strukturerade intervjuer med användare av KaU:s BI-verktyg. Studiens resultat visar att BI påverkar beslutsprocessen vid högskolor genom att *öka kvaliteten på information, reducera tidsåtgången och öka effektiviteten* för användare. Resultatet visar också att för en högskola är det svårt att uppfylla helt och hållet de faktorer som ökar chansen för en lyckad BI-implementation. Tre områden identifierades att vara i större behov av förbättringar än de övriga: *chefs- och ledarskapsengagemang, kultur kring användning av information- och analysverktyg samt nödvändiga resurser.*

## Nyckelord

Business Intelligence, beslutsprocessen, högskolor, universitet, påverkan, effekt, framgångsfaktorer, nyckelkomponenter, implementering, införande

## **Glossary**

**ACS** – Administration and Central Services, department at Karlstad University.

**BI** – Business Intelligence, a term for technologies that gather, store, and analyze data to aid decision-making.

**DMP** – Decision-making process.

**HEI** – Higher education institution, a broad term for institutions offering higher education in various forms, includes universities.

**KaU** – Karlstad University.

**KULI** – Karlstads Universitets Ledningsinformationssystem, Karlstad University's BI application.

## Acknowledgements

This is the final work of our Master of Science in Industrial Engineering and Management with an emphasis in Computer Science. It has been five challenging but great years that we are grateful for and we are now ecstatic to be considered alumni of Karlstad University.

We would like to express our sincere gratitude to our supervisors, Associate Professor Peter Bellström and Associate Professor Donald F. Ross. Thank you for all of your support.

We are especially thankful for all of the people at Karlstad University that participated in our study, as well as for Claes Asker, our initial contact at Karlstad University, that provided us with a lot of valuable information.

Last but not least, a special thanks to our families and friends who supported us throughout our entire time at Karlstad University.

Thank you all for your encouragement. Peace out!

Karlstad, June 2017

*Erik Sjöo*

*Jacob Persson*

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# 1. Introduction

## 1.1. Background

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*Knowledge is power – Petyr Baelish (Game of Thrones 2012)*

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The world we live in today is characterized by complexity and a fast changing global business environment. The continuous technological development is a major contributor to this and also leads to more and more data being produced as well as stored. Lately, cost of acquiring and storing data has declined significantly and consequently the willingness of businesses to gather large volumes of data in order to gain a competitive edge over competitors has increased (Chaudhuri et al. 2011). Organizations have realized the potential value that resides in the data and hence, they search for ways of how to utilize this valuable asset. It is here Business Intelligence (BI) has become an important concept (Agarwal & Dhar 2014), providing useful insights, supporting decision-making and improving performance (Ramakrishnan et al. 2012). Watson and Wixom (2010) chose to define BI as an umbrella term that is commonly used to describe the technologies, applications, and processes for gathering, storing, accessing, and analyzing data to help users make better decisions. Thus, somewhat simplified, BI can be described as a decision support system for firms to improve their businesses and in the end, increase their competitiveness.

Furthermore, according to Chaudhuri et al. (2011), today you will be hard pressed to find a successful organization that has not yet implemented BI. This assertion provides a good indication of how relevant BI is in today's business environment and since previous research has focused on studying the application of BI within the private sector, this thesis will explore the way BI is being used in governmental controlled businesses, more specifically at public higher education institutions (HEIs). This choice of path is also motivated by Gorgan (2015), pointing out the fact that even if decision support systems can be considered as a mature technology that has proven its usefulness in private organizations, it is still in an early stage when it comes to the academic world.

Herschel (2011, p 5) writes: “BI is an area ripe for research due to its impact on business’ and governments’ decision-making activities. However, to date the actual coverage of BI in academic journals has been somewhat limited.” This is today, to some extent misrepresentative since there is more than sufficient information to form an understanding of the subject in certain areas. The

research on the impact of BI on organizational performance for example, has been covered extensively (Elbashir et al. 2008; Hou 2016; Jones 2005; Ramakrishnan et al. 2012). Nevertheless, there are still areas to explore which have not yet reached saturation, particularly on BI's effect on the decision-making process (DMP) at HEIs. Previous research on this topic has been found to be scarce since only a few non-academic reports were found (Diver BI Group n.d.; Diver BI Group n.d.). Additionally, Aziz and Sarsam (2013) who conducted a similar study as their master's thesis at Uppsala University suggested further research on this subject at other HEIs.

Therefore, the purpose of this thesis is to understand how BI influences the DMP at HEIs. When the result of studies of this nature is presented, it is natural to want to figure out why the current situation is as it is and to find ways on how the current situation can be improved. Hence, this study will also aim to identify success factors of BI adoption (gathered from previous research) that are difficult for HEIs to fulfill.

The study will be conducted through a single case study performed at Karlstad University (KaU), a public HEI located in Sweden which implemented BI in 2008. By analyzing the outcome of the study, this thesis also aims to provide a suggested solution for how the case study object could improve on areas needed to become more successful in utilizing BI. Except for staff and managers at KaU, this study will also be of interest to other HEIs or organizations, researchers, and students interested in this thesis' purpose.

## **1.2. Outline of research questions**

The purpose will be fulfilled by answering the two research questions outlined below.

*RQ1: How does Business Intelligence influence the decision-making process at a higher education institution?*

*RQ2: From a user perspective, in a post-adoption stage regarding the implementation of BI, what success factors does a higher education institution have difficulties in living up to?*

From here on, research question 1 will be referred to as RQ1. Correspondingly, research question 2 will be referred to as RQ2.

### 1.3. Case study object

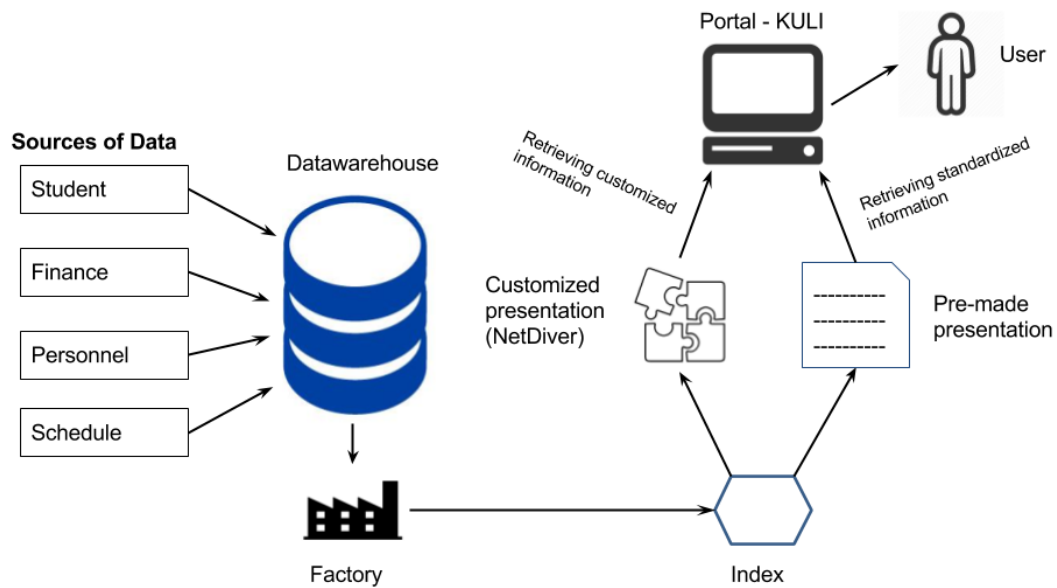
Karlstad University's initial investment in BI took place after a preliminary study carried out between 2006 and 2007 (Infotool n.d.). The main reason for the investment was due to an existing need of information sought by various managers. The investment made it easier for managers to find information concerning financial, personnel, and educational matters. The BI tool is called KULI (Karlstads Universitets Ledningsinformationssystem) translated to Karlstad University Management Information System, and was implemented by the system vendor Infotool who also handles the support.

According to Asker (the University's CIO and IT-strategist)<sup>1</sup>, KULI can be divided into two sections, the pre-made presentation of information and the customized presentation of information. The pre-made presentation displays information of various types, ranging from: historic economic information, especially useful for budget monitoring; to age distribution among staff in order to be able to plan the recruitment process; to general information about specific programs, aimed to aid capacity planning (e.g. plan size of classrooms, amount of teachers needed). The pre-made presentation is decided by the KULI administrator, meaning that the users are not able to alter the way the information is displayed only select the type of information they are interested in. If the users need more detailed or specialized information for a specific purpose, they need to access the customized section of KULI, NetDiver. It is in NetDiver where the users can manipulate and adapt the data in order to retrieve the customized information they seek.

In figure 1, a visualization of the BI system at Karlstad University, according to Asker<sup>2</sup>, is shown. Data from different operational systems is extracted to the data warehouse. The data stored in the data warehouse is then processed through the "factory" where the information is analyzed and sorted. This information is in turn stored in the index, from where the information is either retrieved from the customized section (NetDiver) or the pre-made presentation of information. The information is displayed and visualized for the users in KULI. From here, the users then act on this knowledge by using it in their DMP.

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<sup>1 2</sup> Claes Asker CIO Karlstad University, interview 1st March 2017



**Figure 1: Flow of information in KaU's BI system**

#### 1.4. Outline of thesis

**Chapter 2** provides theories needed to create an understanding of the subject and to help the reader understand the interpretation of the result. The chapter consist of definitions of decision-making and BI, followed by what impact BI has on organizations and the DMP, as well as BI's role in HEIs. The chapter is concluded with the theoretical base that is used in the analysis process.

**Chapter 3** explains how and why the study was conducted in the chosen manner. The chapter ends with a discussion regarding the study's trustworthiness as well as ethical issues.

**Chapter 4** presents and compares the collected empirics from the interviews against the theoretical base.

**Chapter 5** reflects on the result of the research questions, along with a suggested solution for how the case object could make improvements.

**Chapter 6** is the final chapter which presents a conclusion of the findings together with limitations of the study and suggestions for future research.

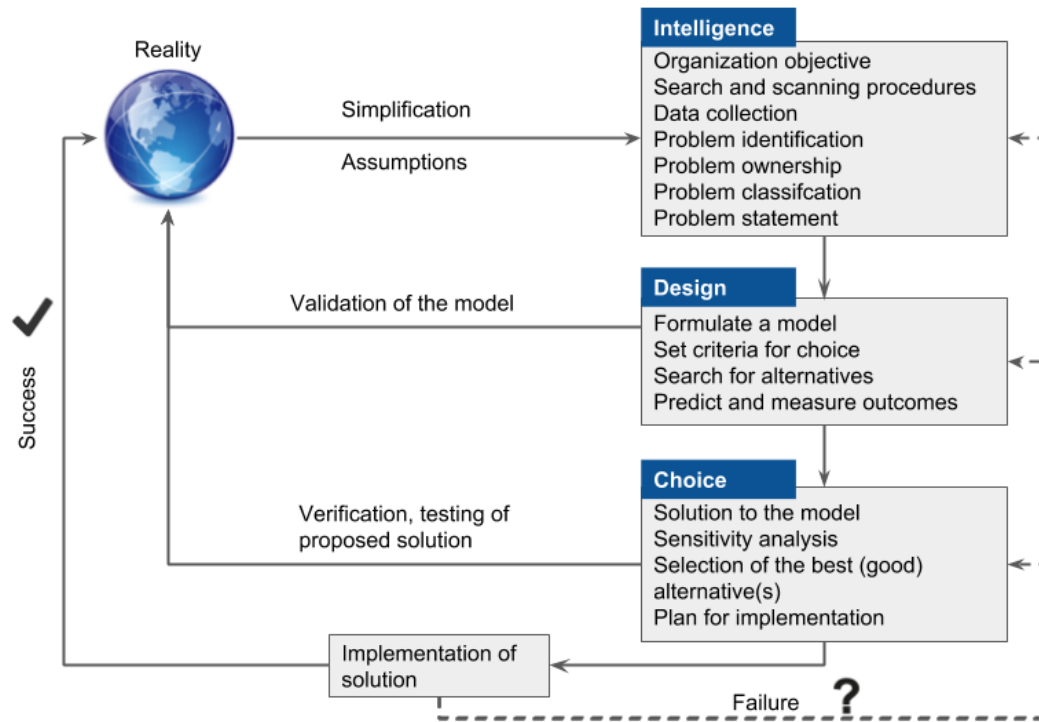
## 2. Literature review

### 2.1. Decision-making

Historically, decision-making has been considered by managers as an art based on creativity, judgement, intuition, and experience. Over time, it has been proven that managers that focus on a more systematic approach emphasizing a methodical, thoughtful, and analytical decision-making process (DMP) rather than relying on interpersonal communication skills, will be more successful in making decisions (Turban et al. 2010).

The fact that decision making plays a vital role within organizations is not difficult to understand. Decisions are clear indicators for action and many times the reason behind success or failure. Furthermore, a failure often requires additional subsequent decisions (Bozeman & Pandey 2004). According to Meier et al. (2015), early research on decision making focused on the idea of synoptic rationality (Braybrooke & Lindblom 1963), implying that managers facing a decision must start by listing all the appropriate alternatives, evaluate them in terms of costs and benefits and finally select the alternative providing the highest level of relative benefit. Similarly, Aliev and Huseynov (2014) explain that decision making implies making a choice between two or more existing alternatives. When it comes to more familiar situations demanding a decision, those can often be solved through an intuitive judgement. However, the result of a choice always depends on uncertain objective conditions of the future. Therefore, a rigorous decision always needs to be based on factors assessed under a certain degree of uncertainty (Aliev & Huseynov 2014).

Simon's (1977) description of the DMP consist of four phases: *intelligence*, *design*, *choice*, and *review*. The first phase, the so called *intelligence* activity, is about searching the environment for conditions that requires decisions. The second phase includes inventing, developing, and analyzing possible responses to the identified conditions and is called the *design* activity. The third phase is called the *choice* activity and involves a selection of particular responses to the noticed conditions. Finally, the last and fourth phase is called the *review* activity and is intended to be devoted to evaluation of previous choices. The DMP defined by Simon (1977) is visualized by Turban et al. (2010) and shown in figure 2.



**Figure 2: The decision-making process, based on Turban et al. (2010, p. 46)**

When it comes to decision-making in private businesses, they have a tendency to make decisions of a short-term nature, usually with a limited number of actors. Governmental organizations, on the other hand, tend to make decisions while having a more low-risk and long-term mindset including consultation and consideration of a large number of actors, e.g. officials, interest groups, and citizens before making decisions (Gang-Hoon et al. 2014). Governmental organizations include but are not limited to HEIs, meaning that some of the aforementioned differences might not entirely represent HEIs but they give an indication that HEIs decision-making differ from private businesses.

## 2.2. Business Intelligence

The business environment is becoming more complex while undergoing constant change. Organizations are responding to pressure through being innovative in the way they operate, which involves adapting and making decisions quickly in regard to strategy, tactics and operations. To be able to make informed decisions of this nature, organizations need to be able to access and interpret considerable amounts of relevant information (Turban et al. 2010). Accordingly, significant investments in information technology (IT) are becoming increasingly important in order to gain a competitive edge and make organizations operate more efficiently (Rezaie et al. 2011). Turban et al. (2010) explain the relationship between a more complex business environment and organizational response as constantly changing factors (markets, customer demands, technology and societal) that puts pressure on and provide opportunities for organizations to be proactive, adaptive, and reactive. Through the use of computerized support systems, which since the mid 90's have been equated to the term Business Intelligence (BI), organizations are empowered to efficiently and effectively respond to these events (Turban et al. 2010). Consequently, traditional decision-making approaches has become outdated and instead organizations make use of IT tools such as BI.

There is no uniform and accepted definition of BI, resulting in each author mostly defining the term individually, however the general understanding of the term and what it consists of is still quite similar between the different definitions. Here are three examples:

Wixom and Watson (2010, p. 14) write that BI “is a broad category of technologies, applications, and processes for gathering, storing, accessing, and analyzing data to help its users make better decisions.”

Yoon et al. (2014, p. 3758) define BI as “innovative tools for data analysis, query, and reporting that [...] enables interactive access and manipulation of data in order to gain valuable insights and to support management decision making process across a broad range of business activities“.

Hannula and Pirttimäki (2003, p. 593) define the BI concept as “organized and systematic processes, which are used to acquire, analyze, and disseminate information significant to their business activities [...]. Companies then use the information and knowledge generated to support their operative and strategic decision-making.”

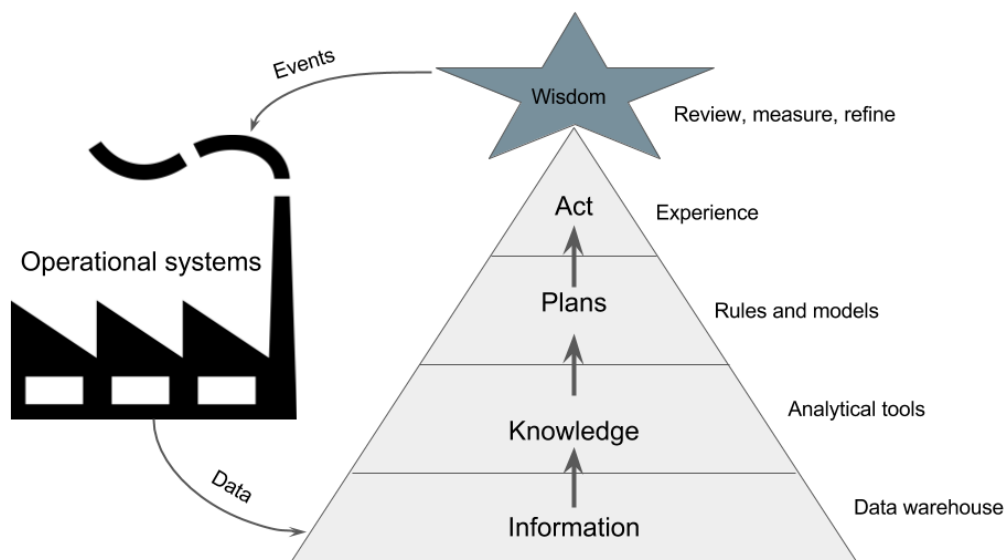


The above definitions of BI use different language and some can be quite hard to understand or difficult to put into a context. However, they still describe and explain the essence of what BI is used for, i.e. BI lets the user access and utilize data, from which the user gains valuable insight that in turn is used to support the DMP.

The definition considered to best explain BI in simple, clear, and concise terms is Wixom and Watson’s (2010) definition, and therefore BI will be defined in this paper as:

Business Intelligence (BI) is a broad category of technologies, applications, and processes for gathering, storing, accessing, and analyzing data to help its users make better decisions. (Wixom & Watson 2010, p 14)

Now that BI has been defined, the features of BI and how it functions in practice will be described. In order to visualize and conceptualize BI, Eckerson (2003) draws comparisons to an oil refinery, shown in figure 3, which is designed to take raw material – crude oil – and process it into products such as gasoline, jet fuel, and lubricants. Similarly, BI can be likened to a “data refinery”, which takes a type of raw material – data – and processes it to information products.



**Figure 3: BI visualized as a data refinery, based on Eckerson (2003, p. 4)**

### **Data to information**

Data is extracted from several transaction and operational systems, integrated and stored in the data warehouse.

### **Information to knowledge**

Information is accessed and analyzed in the data warehouse through analytical tools, which identifies trends, patterns, and exceptions that in turn becomes knowledge.

### **Knowledge to plans**

From knowledge, rules may be established ranging from simple rules – order new products when stock get low; to rules of a predictive nature – forecasts or projections based on historical trends and assumptions; to complex rules – dynamically configured prices in response to fluctuations in the market. Rules are then implemented by creating plans, e.g. businesses may define what products to offer to which customers based on an analysis of customer segments and customer responses from previous efforts.

### **Plans to actions**

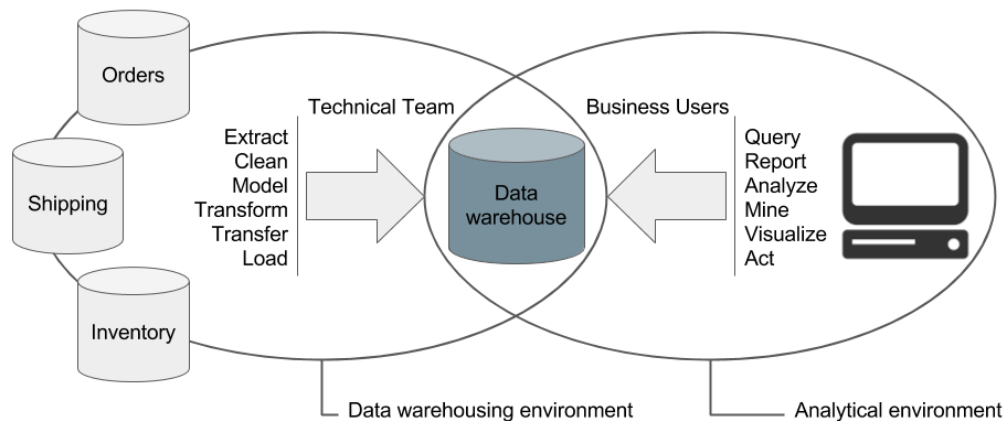
Businesses create action by using the plans that are based on the rules and knowledge.

### **Feedback**

Response data from the actions (e.g. sales) is stored in the data warehouse. This data is then reviewed and analyzed and later turned into knowledge.

Eckerson (2003) further explains that BI is comprised of two components, a data warehouse environment and an analytical environment. In these environments, there are two different types of users, the technical team and the business user. The technical team spends its time in the data warehouse environment extracting, transforming, transferring, and loading transactional data from one or more operational system into the data warehouse. A visualization of this concept is shown in figure 4. Considering the fact that the data not always is clean or consistent between every separate operational system, it is rarely easy to integrate. Therefore, this can be quite a difficult job and involve a considerable amount of effort. The business user on the other hand, interact with the BI system through the analytical environment where the user

receives reports or visual aids; queries the system for specific requests; and at the end, acts on the data from the data warehouse.



**Figure 4: The two components of BI as explained by Eckerson (2003, p. 6)**

Turban et al. (2010) – who base their understanding of BI on Eckerson’s (2003) categorization shown in Figure 4 – argue for a different categorization that is divided into four components:

- Data warehouse – receives data from different sources
- Business analytics – tools that analyze data in the data warehouse
- Business performance management – monitoring and analyzing performance
- User interface – dashboard

Turban et al. (2010) and Eckerson (2003) argue for two different interpretations of how to categorize BI, however they still have similarities in their general division of the aspects of BI. Both divide BI in two spheres where the technical staff is in charge of building the data warehouse while the business users access and analyze the information. Eckerson’s (2003) explanation of BI components is simpler and easier to follow, which is why, for the purpose of this paper, his categorization will be used as a foundation for understanding the BI environment.

Eckerson (2010, p. 3) summarize BI as a system that:

[...] takes data and transforms it into information. Using reporting and analysis tools, users examine the information and convert it into knowledge. Based on the trends they discover in the data, users can create rules to power their operational plans. These plans are executed with actions, and each time an organization cycles through the process, the company gains wisdom about how its business works and what actions achieve the desired effects.

### **2.3. Impact of Business Intelligence**

Research on impact of BI systems can be divided into two different groups – the optimistic ones who argue that BI plays a crucial role in organizations by providing useful insights, support decision-making, and improve performance (Ramakrishnan et al. 2012), and the more critical ones who argue that while there might be benefits of BI it is difficult or almost impossible to calculate or measure its impact on businesses since most of the benefits are intangible, e.g. faster and more accurate reporting, improved decision-making and customer service. This is why it can be hard for some managers to justify BI investments (Turban et al. 2010).

The conclusion drawn by Ramakrishnan et al. (2012) is in line with earlier research by Jones (2005) who argues optimistically that BI facilitate organizations to store, retrieve, and analyze large amounts of information, which in turn leads to a situation where the information can be translated into real value for the organization. The value can be in the forms of learning from past success or failures, identifying opportunities, improving customer profitability, or simply enabling employees to be more productive.

Elbashir et al. (2008) argue that there is a significant relationship between business process performance and financial performance (gross revenue) and that the relationship is mediated and improved by using BI systems. For example, BI's impact on business process performance is argued to be: reduced marketing costs, reduced inventory levels, and increased staff productivity etc.

Similarly to Elbashir et al. (2008), Hou (2016) argues that BI systems indirectly influence financial performance positively through improving performance of internal processes, customer performance, and learning and growth. On the other hand, research that highlights a more neutral or even negative relation between IT investments and organizational performance also exist (Weill 1992; Brynjolfsson 1993). Though, since these papers are quite outdated their relevance can be questioned, however the main point these articles emphasize is the fact that all IT investments are not alike and it is necessary to measure the effectiveness in the context of the specific management purpose where it was made. According to Weill (1992) a traditional measure of IT investments effectiveness, such as financial performance, is too broad and should be broken down into smaller measurements (e.g. strategic, informational, transactional). This is echoed by Elbashir et al. (2008) who argue that it might not be appropriate to only use a measure such as an organization's profitability when

measuring the impact or value of a BI system. This since those measurements are usually not in line with the organization's intention of using the technology, nor show the full influence such systems have on organizations.

Most of the previous research regarding the impact of BI on organizational performance has focused on measuring it financially by increase in revenue, or operational performance by measuring it through increased efficiency in the value chain. However, some researchers present findings more specifically regarding BI and its impact on the DMP.

It is argued by Wieder and Ossimitz (2015) that BI management – managing purpose and strategy; implementation; and support of BI systems – has a positive effect on data quality, information quality, and the scope of BI (number of business functions or processes supported by BI tools). These effects – in combination – translates to a positive effect on the quality of the DMP. In particular, BI management has a significant effect on the DMP through gathering high-quality data and information (Wieder & Ossimitz 2015). This makes sense since if businesses manage their BI system using a clear and transparent strategy of why, how, and where the BI system will be implemented and maintained, it will translate to collecting high-quality information i.e. data of adequate volume that is relevant, transparent, and trustworthy (Wieder et al. 2012).

Rezaie et al. (2011) argue that BI systems reduce the time and increase the efficiency of the DMP by allowing BI systems to acquire information and knowledge from huge volumes of data. This is coherent with Wieder and Ossimitz's (2015) argument – high-quality data and information has a positive effect on the quality of DMP – since if you have access to large volumes of data and possess the power to handle it through a BI system, there will be a greater chance for you to have more relevant information at hand leading to better decisions in less time.

Similarly, Hou and Papamichail (2010) identified that BI has positive impacts on decision-making, arguing that an enterprise resource planning (ERP) system integrated and powered by BI increases the decision-making performance of organizations, unlike organizations that only use ERP. This means that an organization increases their decision-making performance by implementing and integrating BI with their current systems. The increase in decision-making performance was noted in several areas such as reduced time needed to make

decisions as well as making those decisions more reliable, providing more solutions, identifying problems faster, and using additional information sources.

Aziz and Sarsam (2013) also identified positive impacts on decision-making when conducting a case study at Uppsala University. They found that the decisions take less time, are of a better quality, and are much easier to make.

#### **2.4. Success factors for Business Intelligence adoption**

Difficulties may arise when implementing BI since it is not a standardized system that can be implemented quickly like normal transactional/operational systems, instead it must be customized to fit each organization's specific needs and in order for the implementation to be successful it is important to align BI with internal business processes and organizational culture (Harrison et al. 2015). Ramakrishnan et al. (2012, p 494) argue in their paper that having an "understanding for the relationship between the purpose for implementing BI and BI data collection strategies may prove vital for the success of any BI initiative". Safer and Zafar (2011) argue that another aspect vital for BI success is to make sure that the technical team and the business users communicate properly or even have a dedicated group consisting of both IT and business users. Without a dedicated group or communication between the two different units there will be disadvantages such as difficulties in using BI tools, conflicts in data accuracy, over investments in BI projects and time spent on data analysis may be longer than the time spent on data collection since the data might be hard to interpret.

Eckerson (2003) argues that there are six characteristics an organization needs to have in order to be successful in implementing BI:

1. Upper management is highly committed and actively involved in the project
2. Business users and technical team work closely together
3. BI system is considered a vital enterprise resource and is allocated adequate resources to ensure long term-growth and viability
4. Firms provide users both static and interactive online views of data
5. The BI team has prior BI experience and is assisted by independent consultants in a partnership
6. The organizational culture reinforces the BI system

The decision to apply BI systems is made at an organizational level in regards to the organizational needs but the effectiveness and ultimately the success of BI is often influenced on a more individual level (Yoon et al. 2014). Yoon et al.

(2014) argue that there are several determining factors categorized in four categories: technology, motivation, social influence, and situational constraints.

#### Technology:

- Perceived advantage: advantage of BI over existing solutions within the organization
- Complexity: how difficult BI is to understand
- Compatibility: consistency with existing values, experiences, and needs of the organization

#### Motivation:

- Extrinsic motivation: will BI improve the job performance and effectiveness?
- Intrinsic motivation: using BI is enjoyable and pleasant

#### Social influence:

- Managers' and co-workers' view of BI

#### Situational constraints:

- Requisite skills & resources: possess skills and resources necessary to use BI
- Organizational learning & growth culture: encourage employee learning and development

Whenever organizations want to invest in new technology, there will be obstacles to overcome before success can be achieved in incorporating the technology in the organization's operations. Hasan et al. (2016) reviewed existing research and concluded that there are three major categories that determine the readiness of HEIs to adopt and implement a BI system: organizational, technology, and social. These factors are deemed vital to ultimately decide if the deployment of BI will be a success or to some extent a failure. Moreover, these factors are considered as core elements and they are supported by sub-elements, shown in the list below.

#### Organizational:

- Strategic alignment: strategic alignment in a BI context occurs when three elements are present. Firstly, business strategies and business processes should be consistent and reinforcing. Secondly, the BI project's main focus should be to improve key organizational processes that determine productivity and service. Finally, the project should be supported by IT strategies, infrastructure and an IT organization (Williams & Williams 2004).

- IT partnership: when creating business value through the use of BI, an effective partnership between IT and business is needed (Williams & Williams 2004).
- Education requirement & policies: policies help HEIs being more ready in deploying BI (Hasan et al. 2016).
- Management & leadership: top management plays an essential role when it comes to ensuring the readiness of a BI deployment in an organization (Guster & Brown 2012). Top management bears the primary responsibility for the BI implementation (Chang et al. 2015).

#### Technology:

- Technical readiness: to capture the business value of BI, a certain degree of technical ability is needed. This in order to deliver the information and analytical applications that comprise BI (Williams & Williams 2004).
- Data source / Information: it is important that the sought data are easily accessible to ensure the efficiency in managing the output (Powers 2011).

#### Social:

- Decision process engineering: good usage of structured decision processes to increase the effectiveness of certain recurring decisions. For example, what needs to be analyzed, by whom, in what time frame and using what tool? (Williams & Williams 2004).
- Culture around use of information & analytics: organizations that embrace the use of information and analytics are favorably positioned when it comes to leveraging investments in BI (Williams & Williams 2004).
- Continuous process improvement culture: the business users must be open to change the current business processes in order to leverage BI (Williams & Williams 2004).

Worth noting is that Eckerson (2003) also emphasizes that success factors and other traits do not necessarily guarantee success, but they position the organization to better utilize the full potential of BI.



## **2.5. Business Intelligence in higher education institutions**

The primary mission of governments and businesses are not completely different, however they still differ in their goals and values. The main goal of businesses is to earn profit through sales of products and services, sustaining competitiveness and creating value to stakeholders. As for governments, the main goal is to preserve order, develop sustainably, protect the basic rights of citizens as well as provide general welfare and economic growth (Gang-Hoon et al. 2014). Now the part of government in this sense is a bit broader and might be a more fitting description for the City Council or County Government than for the role public HEIs play in our society. However, it does highlight a different sense of why and how HEIs run their operations in comparison to private businesses.

The higher education sector has needed to adjust to increasing demands of operational efficiency while still remaining competitive and relevant for students and researchers (Barrett 2010). The higher education sector today is a dynamic and complex environment with an increasing competitiveness between universities due to the rapid development of information and communication technologies (Kabakchieva 2015). Verjel and Schmid (2015, p. 716) points out that “competitiveness and sustainability are mutually reinforcing concepts”, with sustainability representing the ability to maintain itself in the long-term. In similar fashion as regular businesses, universities have been affected by an increasing globalization (Kabakchieva 2015), and according to Verjel and Schmid (2015) in the current context of globalization, developing a sustainable business requires considerations in three dimensions: economic, environmental, and social. This argument follows the argumentation of Elkington (1999), who argues that companies should prepare three bottom lines that they need to relate to and identify with, meaning to not fall short of their own bottom lines in any of the following three categories: the traditional measure of profit, a measurement of how socially responsible the organization is, and a measurement of the level of responsibility in regards to the environment. Hence, to act sustainably, the organization needs to take into account all of the three categories when making decisions and not just focus on the economic growth at the cost of the environment or its employees (Elkington 1999).

Furthermore, specifically regarding competitiveness and BI, Kabakchieva (2015) argues that HEIs that want to stay competitive have realized the need to analyze the available data to thoroughly understand their organization in regards to their students, administrative staff, class and schedule information etc.

(Kabakchieva 2015). The adoption of advanced analytical technologies e.g. BI and data mining technologies provide possibilities to extract useful information to enhance decision-making and improve organizational efficiency (Kabakchieva 2015).

However, some hurdles have arisen and Green et al. (2009) argue that while it is true that BI may be adopted in HEIs, similarly to business environments, there is no unified approach on how to do it. Considering it takes a lot of planning to implement BI in small and medium sized businesses, it is fair to argue that it is also difficult applying BI to public HEIs. Successfully implementing BI in HEIs can also be problematic considering political factors such as the matter of who the owner of the data is and how the data should be protected (Guster & Brown 2012).

In spite of this, BI is recognized as an essential way for educational institutions to assess internal processes at universities (Cech & Bures 2006 referenced in Lupton 2010). With this in consideration, it is also worth mentioning that since most of the previous research has been on HEIs outside of Sweden where this study is conducted, the findings are not necessarily 100% transferrable. However, the findings are still relatable since public HEIs are considered to have similarities between each other, even across borders.

Furthermore, Olsson et al. (2012) show that BI can be of great use in managing a HEI, more specifically Uppsala University where the BI tool is called GLIS (Generellt ledningsinformationssystem) for Generalized Management Information System. At first it was aimed only at a central level where it was used to inform management on the annual process of planning and reporting, but since adopting a commercial product – The Diver Solution – as a technological platform, it has been developed to serve the needs of the university on various other levels. It has been used in handling the admission process and the planning of student intake, balancing student load in regards to courses, follow up analysis of educational programs and bibliometric analysis of publication data (Olsson et al. 2012). Other HEIs in Sweden have started to follow suit and have implemented a similar BI system. Linnaeus University has noticed several benefits with the new tool such as the need to ask fewer questions, being able to spend more time on analysis rather than finding information, not needing to be an expert on every system they own in order to be able to extract relevant information, as well as having higher quality of information to make important decisions (Diver BI Group n.d.). Umeå University has used the same technology as Linnaeus University and their BI

system has helped them save time, e.g. the process of compiling personnel information was reduced from 2 weeks to a couple of minutes; as well as offered better insight and control into their operations (Dynamic Business Informatics 2014).

## 2.6. Summary of literature

The literature review began by describing the decision-making process (DMP) in a concrete and simplified way, explaining that decision-making implies making a choice between two or more existing alternatives (Aliev & Huseynov 2011). The DMP was then further explained through the eyes of Simon (1977), stating that the DMP consist of four phases named: *intelligence*, *design*, *choice* and *review*. The *intelligence* phase is about searching the environment for conditions that requires decisions. The *design* phase includes inventing, developing and analyzing possible responses to the identified conditions. The *choice* phase involves a selection of particular responses to the noticed conditions. Finally, the *review* phase encompasses the evaluation of previous choices.

When describing Business Intelligence (BI), a clear and concise definition of the term BI was provided by Wixom and Watson (2010, p. 14) who define BI as “a broad category of technologies, applications, and processes for gathering, storing, accessing, and analyzing data to help its users make better decisions”. Furthermore, Eckerson (2003) describes BI as a cycle where data is extracted from several transaction and operational systems, analyzed to identify trends and patterns, from which knowledge is gained that the company then uses in their actions. Results from actions are stored as well, in order to be analyzed and to gain further knowledge. Eckerson (2003) continues to explain that BI is comprised of two components, a data warehouse environment and an analytical environment, with two different types of user groups, the technical team operating in the former and the business user operating in the latter environment.

Research on the impact of BI on organizations is divided into two groups. On one hand there are the optimistic ones who argue that BI provide several benefits including providing useful insights, support decision-making, improve performance (Ramakrishnan et al. 2012), identifying opportunities, enabling employees to be more productive (Jones 2005), improving internal processes and customer performance (Hou 2016; Elbashir et al. 2008). On the other hand, there are the more critical ones who argue that it is impossible to calculate or

measure BI's impact since most benefits are perceived as intangible (Turban et al. 2010) and using an organization's profitability or financial performance might not be appropriate as a measurement, instead the performance needs to be measured in the context of its specific management purpose (Elbashir et al. 2008; Weill 1992).

Research presenting findings regarding BI and its influence on the DMP has primarily been positive. It has been shown that BI has a direct or indirect effect on the quality of the DMP, particularly through increasing data and information quality (Wieder & Ossimitz 2015). The link between quality of data and information, and quality of decision-making has been explained by Rezaie et al. (2011) using the argument that BI systems allow acquiring information and knowledge from huge volumes of data which in turn means that decisions can be made in less time and with increased efficiency. When integrating BI with existing systems or processes, Hou and Papamichail (2010) note an increase in decision-making performance in several areas such as reduction of time needed to make decisions as well as making those decisions more reliable, providing more solutions, identifying problems faster, and facilitating usage of additional information sources.

Several factors have been identified as key components to increase the chance of a successful BI adoption. Yoon et al. (2014) provide an individual-level perspective where they highlight several determining factors divided in four categories: technology, motivation, social influence, and situational constraints. From an organizational-level perspective, Hasan et al. (2016) mention three major categories: organizational, technology, and social, that determine the BI readiness of HEIs.

Finally, Olsson et al. (2012) have shown that BI has been of great use in managing Uppsala University. Aziz and Sarsam (2013) conducted a case study at the same university where they found that BI positively affected the DMP by reducing the time needed to make decisions, as well as making decisions easier and of a better quality. Similarly, other HEIs in Sweden have experienced benefits after implementing BI. Linnaeus University for example, found that they need to ask fewer questions, are able to spend more time on analysis and less time on gathering information, and provide higher quality of information (Diver BI Group n.d.). Umeå University also found that BI helped them save time in several areas and offer better insight and control into their operations (Dynamic Business Informatics 2014).

## 2.7. Literature discussion

Previous research and surveys of the impact BI has on the DMP, included in the literature review section, is categorized and grouped to create four major impacts as is shown in table 1.

**Table 1: Condensed overview of BI's impact on the DMP**

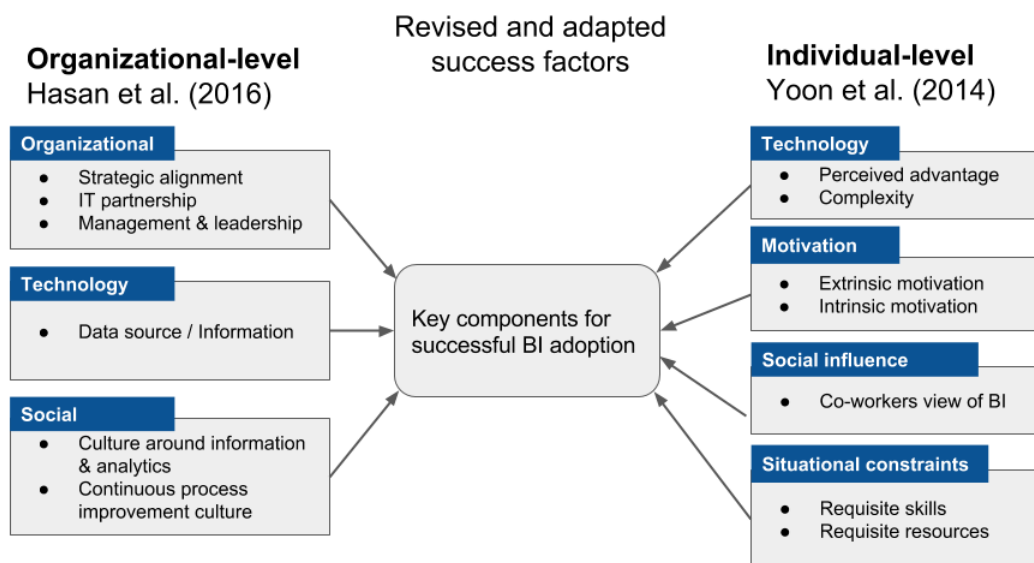
BI's impact on the DMP	Source
Increasing quality of information ( <i>High-quality information – data of adequate volume that is relevant, transparent, and trustworthy</i> ( <i>Wieder et al. 2012</i> ))	Aziz & Sarsam (2013) Diver BI Group (n.d.) Hou & Papamichail (2010) Jones (2005) Weider & Ossimitz (2015)
Reduced time needed for decisions	Aziz & Sarsam (2013) Diver BI Group (n.d.) Dynamic Business Informatics (2014) Hou & Papamichail (2010) Rezaie et al. (2011)
Increased efficiency	Hou & Papamichail (2010) Rezaie et al. (2011)
Offer more choices/solutions	Hou & Papamichail (2010)

When comparing the success factors presented by Eckerson (2003), Yoon et al. (2014) and Hasan et al. (2016), it can be discerned that Eckerson's (2003) factors are older and have been used to some extent – partially or wholly, independently or jointly – by Yoon et al. (2014) and Hasan et al. (2016). Therefore Eckerson's (2003) factors will be considered redundant. Yoon et al. (2014) have chosen to approach the success from the viewpoint of individuals while Hasan et al. (2016) describe success from an organizational-level, and together they generate a comprehensive overview of what it takes to be successful in adopting BI.

When evaluating the relevance of each factor from Yoon et al. (2014) and Hasan et al. (2016) against the research questions to develop interview questions, it was concluded that while it is important to include each category, not every factor is relevant for this study. From Yoon et al. (2016) it was decided that *compatibility* (consistency with existing values, experiences, and needs of organization) in Technology is decided by management above the interviewees and therefore not within their responsibility or influence. Similarly, for three factors from

Hasan et al. (2016) – *education requirement & policies, technical readiness, and decision process engineering* – it was decided that the respondents would not be able provide adequate answers to questions on these areas since this study is delimited to provide answers from a user perspective. *Organizational learning & growth culture* in situational constraints will be merged with *requisite skills & resources*, with the argument that in order to provide a culture of learning and growth the workers have to be provided with opportunities to learn and grow which is considered to coincide with being provided *requisite skills & resources*. Since *requisite skills & resources* now covers a lot of different variables, it was felt that it would be best to divide them into two different factors: *requisite skills* and *requisite resources*. Additionally, seeing as how the managers’ view will be brought up under *management & leadership* in Hasan et al. (2016), the factor *managers’ and co-workers’ view of BI* will be focused on *co-workers’ view of BI*.

The success factors from Yoon et al. (2014) and Hasan et al. (2016) are revised with the modifications mentioned, resulting in figure 5. These are the key components for successful BI adoption that will be used as a basis for the evaluation and analysis process.



**Figure 5: Key components for successful BI adoption**

Furthermore, all of the factors from Hasan et al. (2016) and Yoon et al. (2014) have been subject to interpretation in order to find appropriate and relevant questions for the interviewees. How the factors have been linked to the interview questions (see appendix A1) is displayed in appendix A2.

The literature review presents an overview of previous research of BI's impact, which has mostly focused on organizational performance, and while there has been research on BI's impact on the DMP, it has not yet reached saturation. The research on the impact of BI on the DMP at HEIs is also far from being saturated, mainly due to the volume of previous research on this topic and the fact that most of the found information has come from sources that are not peer-reviewed research papers. In addition to this, a master's thesis from Aziz and Sarsam (2013) suggested as future research, to conduct studies at other universities in Sweden. All of this coupled with our notion and belief that BI can be a great tool for HEIs in Sweden is why this study is important and will contribute to the research.

### 3. Method

#### 3.1. Research purpose and approach

The purpose of this thesis is to understand how Business Intelligence (BI) influences the decision-making process (DMP) at a higher education institution (HEI) and also – from a user perspective, in a post-adoption stage regarding the implementation of BI – find out what success factors a HEI have difficulties in living up to. The purpose will be fulfilled through an analytical process performed in a deductive manner where the existing theory act as the starting point and conclusions are drawn in respect to the theory.

#### 3.2. Literature review

The study first started with a literature review. Conducting a literature review and reading key contributors' books and articles is, according to Bryman & Bell (2011), very important to be able to prevent a situation where you risk exploring what is already known. Thus, the literature review was conducted in order to find out what earlier research within the area has concluded and at the same time, identify existing controversies and potential areas open for further research. In the meantime, it became clear who the key contributors to this specific research topic are.

The majority of the references included in the literature review was found using the search function called ONESEARCH located at the homepage of the library of KaU (Karlstad University 2017a), however the search engine Google Scholar (Google Scholar 2017) was also used. A number of different content providers are made available to students registered at KaU free of charge through ONESEARCH. This search engine provided more than sufficient research material and any additional services was considered an expensive unnecessary luxury. In ONESEARCH, an optional way of searching called advanced search was used and when searching for relevant literature, several keywords were used in different combinations. To be sure that appropriate keywords were used, many of them were identified along the way of the literature review as well as through the use of a thesaurus. Below, are a few examples of how a search was structured.

- "business intelligence" AND ("decision making process" OR "decision-making") AND ( "institutions of higher education" OR "higher education institution" OR "universities" OR "colleges" )
- "business intelligence" AND ("decision making process" OR "decision-making") AND ( "impact" OR "influence" OR "effect" )



- "business intelligence" AND ("decision making process" OR "decision-making") AND ( "benefits" OR “advantages” OR “strengths” OR “disadvantages” OR "drawbacks" OR “shortcomings”)
- "business intelligence" AND ("decision making process" OR "decision-making") AND ( “key factors” OR “success factors” OR “success”)
- "business intelligence" AND ("decision making process" OR "decision-making") AND ( “implementation” OR “adoption”)

In addition to the keywords, the search was further limited to peer reviewed publications often together with a specified date range to ensure the relevance of the search result. Besides performing the above mentioned search procedure, the literature’s own reference lists also guided the literature review. By examining an academic article’s reference list, a good piece of advice regarding other appropriate references was obtained. However, the literature review did not stop here. To be able to really reach information specific to this study’s topic, books, a few websites, and consultancy reports also were included.

### **3.3. Formulating research questions**

The next step in the research process was the formulation of research questions. Bryman & Bell (2011), claim that research questions are helpful in many different ways. For example, they guide decisions regarding what kind of research design to employ and what data to collect. It was these arguments that led to the early formulation of research questions. By using the background information gained through the literature review, an idea of a specific aspect to delve further into arose. The idea was basically centered on BI, the DMP and public HEIs. In order to find out if KaU could be a suitable candidate for the case study, a first meeting was held with one of the university’s key persons involved in KaU’s implementation of the BI system. From this meeting, a general picture of the BI-use at KaU was obtained and it became clear that this study’s investigation could be valuable to the organization. In the beginning, several potential research questions were discussed but after a period of reflection they were reduced to the number of two. These two questions were later on, during the course of the study, further specified to better suit the study’s purpose.

### **3.4. Choice of research strategy and design**

According to Bryman & Bell (2011), business research are often divided between two approaches, namely the quantitative and qualitative research strategy. The way this thesis’ research questions were formulated indicated that

the research strategy needed an explorative approach in order to be able to provide answers to the questions. Consequently, the study required a type of strategy taking into consideration that the collected data would consist of words rather than numbers. This fact, in combination with the support from Bryman and Bell (2011) as well as Denscombe (2009) stating that a qualitative research strategy is favorable in this type of situation, led to a qualitative research strategy finally being adopted. Regarding the choice of research design, the research questions governed the final decision. To be able to understand how BI affects the DMP at HEIs, a rich detailed description of a HEI's own view was desirable and the choice therefore fell on a case study design. It is considered as a legitimate choice as both Stake (1995) and Harrison et al. (2017) claim that case study research deals with the investigation and understanding of specific situations of a more complex nature.

### **3.5. Data collection**

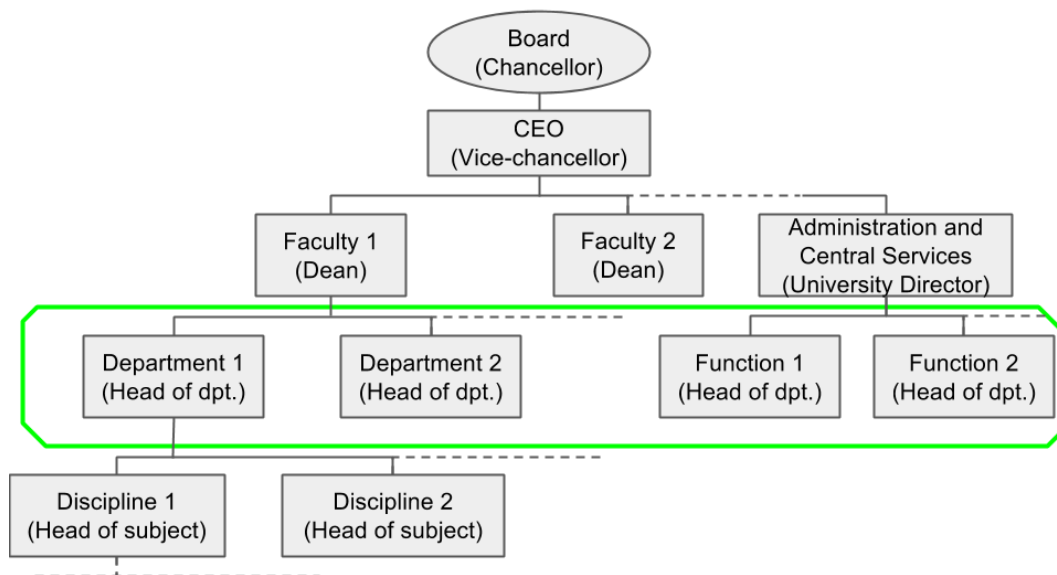
The case study was conducted at Karlstad University (KaU), a Swedish public HEI with about 16 000 undergraduate students and 1 200 employees (Karlstad University 2017b). KaU was primarily selected with respect to the formulated research questions and secondly due to the fact that both authors were registered as students at KaU during the time of research. This facilitated many practical issues such as the limited amount of time, financial resources and options regarding transportation.

#### ***3.5.1. Interviews***

When it comes to qualitative research, the most commonly used data collection method is interviewing (King & Horrocks 2010). An interview can be conducted in a number of ways, Saunders et al. (2009) choose to categorize interviews in three different groups: structured, semi-structured and unstructured or in-depth interviews. However, the most common types in qualitative research are the unstructured and semi-structured interview approaches (Bryman & Bell 2011). Bryman & Bell (2011) further explains that compared to quantitative research, qualitative research puts a greater focus on interviewees' own perspectives which justifies the interviews to be much less structured. Since this thesis is based on a qualitative research strategy in which the interviewees' own perspectives are highly valued, semi-structured interviews is an appropriate choice. The reason for not choosing unstructured interviews, was mainly due to this thesis' analytical framework. The framework builds on concepts that needed to be elaborated on in some way during the interviews and since semi-structured

interviews, unlike unstructured ones, are conducted using an interview guide that often includes questions on rather specific topics (Bryman & Bell 2011; Saunders et al. 2009), semi-structured interviews was considered as more suitable.

To recruit the study's interviewees, invitational e-mails were sent to the different user-groups of KULI (see appendix A5). There are mainly two groups of users at Karlstad University that utilizes KULI in some way: head of departments (shown in figure 6) as well as experts that are subordinates of head of departments within Administration and Central Services (ACS)<sup>3</sup>. At first the invitational e-mails were only sent to head of departments. However, several of the invitees declined to participate on the grounds that they do not use KULI extensively or even at all. Due to this, the scope was adjusted to also include experts within ACS and hence, the final sample of the study includes both head of departments and experts within ACS. Both of these groups are considered to belong to the type of user Eckerson (2003) classifies as a business user. Thus, the other type of users called the technical team (Eckerson 2003), are not included. The sampling of only business users are justified by RQ1 which is from a perspective of the groups that use KULI in their DMP, and RQ2 that is from a user perspective.



**Figure 6: Hierarchical map of where the sampling at KaU was made**

<sup>3</sup> Claes Asker CIO Karlstad University, interview 1st March 2017

When it comes to sampling in qualitative and small-scale research, it is not that straightforward. Compared to quantitative research, it is often more challenging to calculate the exact sample size (Denscombe 2009).

Denscombe (2009), further explains that this is many times due to limitations regarding available resources, time and number of appropriate individuals being reachable. In this thesis, purposive sampling was performed. According to Bryman and Bell (2011), this type of sampling is highly prevalent in qualitative research and essentially has to do with the selection of units having a clear link to the research question(s). In addition, Saunders et al. (2009) claim that purposive sampling is beneficial in research where there is an in-depth focus and a rather small existing sample. Bearing this in mind, the choice of purposive sampling as a sampling method is considered reasonable, this since the applied research strategy was qualitative and conducted through a case study design involving quite a few number of units.

According to Denscombe (2009), as a rule of thumb, the sample size ought to be comparable to the sample size used in other similar studies and large enough for the research purpose to be achieved. In this study, a total number of eight individuals were interviewed. When choosing this particular number of interviewees, all of the aforementioned aspects were taken into consideration, i.e. available resources, time, number of appropriate individuals and what sample sizes that had been used by others in similar research. Because of this, the finally chosen sample size should be legitimate.

#### *Description of interviews*

The interviews were always performed at a location chosen by the interviewee. In that way, they were not too much affected by the somewhat unusual situation and most likely led to more credible answers. The interviews were held in Swedish since this is the native language of both interviewers and interviewees. Consequently, all of the quotes have been translated to English (see appendix A3). Before starting an interview, it was verified that the interviewee had read the consent form (see appendix A4) and was willing to sign it. All interviews were recorded using two smart-phone devices. The length of the audio recordings varied between approximately 30 – 50 minutes, depending on how much an interviewee was willing to say and how often the interviewers felt that follow-up questions were needed. Details regarding the interviews are shown in table 2. The semi-structured interviews followed the interview guide (appendix

A1), with additional questions or deviations from the guide depending on each interview.

**Table 2: The interviewee’s position within the organization together with the date and duration of each interview**

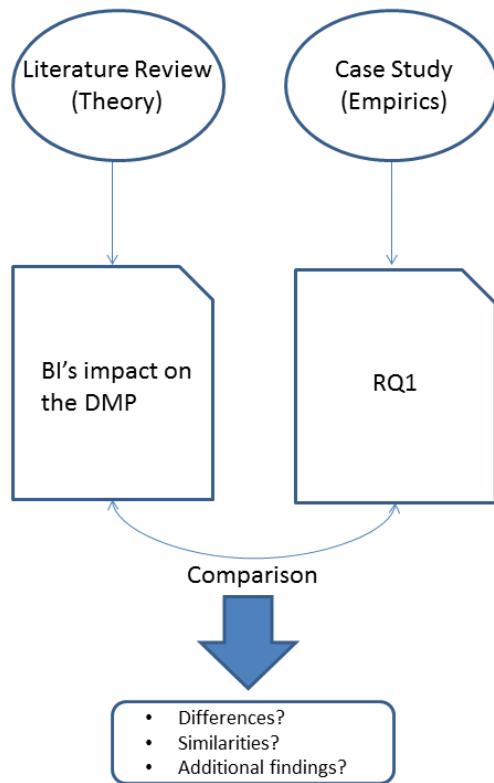
<b>Interview</b>	<b>Position</b>	<b>Date</b>	<b>Length of audio recording (min:sec)</b>
1	Head of department	2017-04-11	52:09
2	Head of department	2017-04-12	61:44
3	Head of department	2017-04-18	42:24
4	Expert within ACS	2017-04-18	51:22
5	Expert within ACS	2017-04-18	52:03
6	Head of department	2017-04-19	48:57
7	Head of department	2017-04-19	33:31
8	Expert within ACS	2017-04-27	31:48

### **3.6. Data analysis**

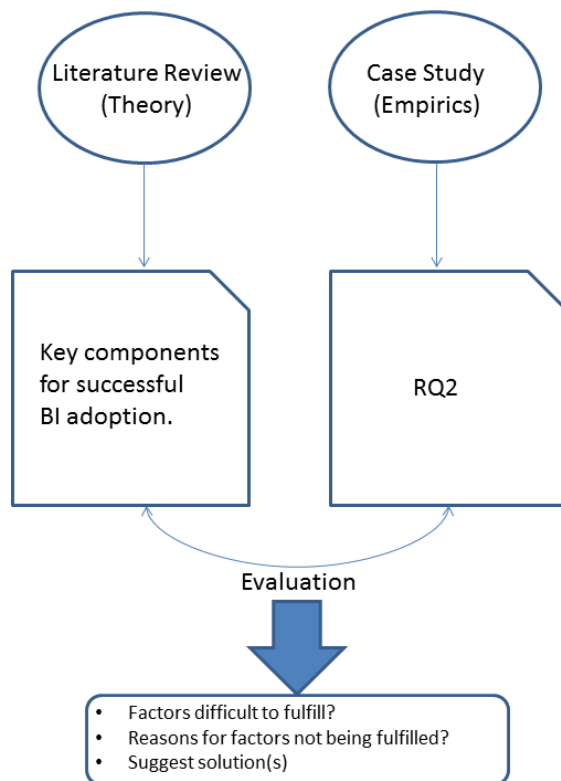
This section aims to explain how the data was analyzed in regard to previous theories. Two pictures depicting the analytical processes for the two research questions are included, figure 7 for RQ1, and figure 8 for RQ2.

The first figure, figure 7, accounts for RQ1’s analytical framework where quotes from the interviews were analyzed as well as compared against the DMP definition provided by Simon (1977) and previous theories of the impact of BI (shown in a condensed overview in table 1), to find differences, similarities, and additional findings. Table 1 facilitated the process of identifying a pattern between the theories, and at the same time it allows for the analysis process to be more transparent and understandable to the reader.

A similar procedure as for RQ1 was applied for RQ2 (figure 8). However in this case, the aim was to identify potential causes of problems and to provide suggestions for how to solve these. Here, the theory about BI readiness (Hasan et al. 2016) and success factors (Yoon et al. 2014) displayed in figure 5, formed a basis when evaluating the results from the interviews.



**Figure 7: Analysis model for RQ1**



**Figure 8: Analysis Model for RQ2**

After all the interviews had been held the audio recordings were listened to by both authors individually and at the same time, afterwards key quotes were noted in order to aid the analysis process. The reason for both authors listening through the interviews was partly to prevent the study from missing out on valuable data and also to allow for each of the authors' own perspective. For RQ1, the quotes were placed below headings corresponding to their impact on the DMP. Regarding RQ2, the key quotes were grouped and placed under headings corresponding to the key components for successful BI adoption included in figure 5.

The procedure of transcribing key citations was used due to the fact that not everything said by the interviewees is considered as important to the study and that a complete transcription of each interview would require an amount of time that was believed not to be available. This is in accordance with suggestions found in Bryman and Bell (2011). Furthermore, it is worth mentioning that the focus during the interviews was on what was said and not how it was said.

### **3.7. Quality assurance**

#### ***3.7.1. Trustworthiness***

This section is going to deal with the issues connected to the study's trustworthiness, i.e. to which degree the findings can be trusted (Lincoln & Guba 1985). If the findings cannot be trusted, the research does not carry any value. Thus, the establishing of trustworthiness is a very important aspect for any inquirer conducting scientific research. Bryman and Bell (2011) argue that the opinion among researchers is divided as for how to actually assess the quality of a qualitative study, however Lincoln and Guba (1985) claim that at least different criteria from those being used in quantitative research must be applied. They describe trustworthiness as being built up of four criteria: *credibility*, *transferability*, *dependability* and *confirmability*.

*Credibility* refers to whether or not there is a match between the researchers' findings and the following theoretical ideas developed from them (Bryman & Bell 2011). In order to strengthen the *credibility* of the study, the recommendation from Bryman and Bell (2011) on using respondent validation was followed. Selected quotes together with our interpretation and contextualization was sent back to the respondents for confirmation so that no misunderstandings occurred. For information regarding the formulation of the respondent

validation e-mail, see appendix A6. Since qualitative research most of the time entails a thorough analysis of a smaller group of individuals, the findings also tend to be tightly connected to a unique set of circumstances (Bryman & Bell 2011). This fact leads to a situation where the *transferability* can be questioned, i.e. the possibility to generalize the findings to others research settings, such as other organizations (Saunders et al. 2009). In this thesis, the *transferability* is ensured by providing rich accounts of the situation at the case study object i.e. thick description (Geertz 1973), which argued by Lincoln and Guba (1985), is to provide the reader with “a database for making judgements about the possible *transferability* of findings to other milieux” (Bryman & Bell 2011, p. 402). *Dependability* is the third criteria and can be translated to the degree to which a study can be replicated by others (Bryman & Bell 2011). Since the thesis includes a section that provides an account for the research process, it is assumed to exist quite good opportunities for a possible replication of the study. Moreover, in business research it is well known that complete objectivity is impossible to reach since the researcher’s interpretation of data and understanding of the social world will be influenced by earlier personal experiences (Bryman & Bell 2011). Nevertheless, the last criteria of trustworthiness deals with this issue and is called *confirmability*. *Confirmability* is about showing that the researcher’s own knowledge and personal values do not impinge on the research (Bryman & Bell 2011). In this research, the *confirmability* is strengthened through the act of respondent validation. In that way, respondents can confirm that the findings really reflect their own personal view and not the researcher’s.

### *Ethical issues*

Ethical issues are bound to be present in many situations of business and management research. Thus, it cannot be overlooked (Bryman & Bell 2011). Diener and Crandall (1978) describe four common areas of ethical principles in business research. Firstly, they mention harm to participants and lack of informed consent. Then they point to the invasion of privacy and the occurrence of deception. In this study, *The Swedish Research Council’s ethical principles in humanities and social sciences* (Vetenskapsrådet 2002) were used. These ethical principles are based on four main requirements. The first requirement involves informing the study’s participants about the research purpose. The second requirement clarifies that the participants have the right to decide on their participation. The third requirement tells us that the participants should be given the utmost level of confidentiality and lastly, the fourth requirement states



that collected data from individuals cannot be exploited somewhere else than within research.

Accordingly, to be able to live up to the above mentioned principles and ensure that the research was ethically responsible, several steps were taken. To start with, an informed consent form was created (see A4 in the appendix) to make sure that there was no lack of informed consent. The form includes, information about the research purpose, expectations of the participant, and short explanations of how the four main requirements of *The Swedish Research Council's ethical principles in humanities and social sciences* are taken into account. In addition to this informed consent form, all the interviewees were treated individually and always informed in the beginning of the interview session about their right to refuse answering a question on any grounds whatsoever.

In this study, the respondents' anonymity was considered as an extra important issue by the authors and in order to protect them, their identities were kept hidden by assigning them with titles in the form of: interviewee 1, interviewee 2, etc. Furthermore, it was made sure that no interview responses used in the thesis, alone or in combination with other responses, could reveal a participant's identity. Also worth mentioning is that the recordings always were kept on password protected devices.

## 4. Result

### 4.1. BI's impact on the decision-making process – RQ1

This section aims to answer RQ1 – *how does Business Intelligence influence the decision-making process at a higher education institution?* Quotes from the interviews will be analyzed against previous theories included in the analytical framework, see table 1.

Generally, the overall view of the respondents' answers concerning what KULI is used for, is that it mainly works as a supportive tool for detecting conditions in need of action. Two quotes summarizing the interviewees' answers that support this opinion can be found below.

*[KULI] Has felt like a support system that has presented information and that has had an impact on what you do and what you choose to follow up on. – Interviewee 6*

*The first step is to create an overall picture, but I do not [necessarily] make decisions but I make further enquiries if something deviates. I decide to delve deeper based on where it deviates. – Interviewee 1*

Regarding in what way the DMP is affected by KULI is presented against previous theories below. The result highlights that the view of the impact is related to three out of four identified impacts shown in table 1: *increased quality of information, reduced time, and increased efficiency*. Concerning the omitted fourth impact – *offering more choices/solutions* – the interviewees did not provide any insight reflecting this suggested impact.

#### Increased quality of information

The common notion among the interviewees, is that KULI provides information that is readable, understandable, and reliable. This is summarized by the following quotes:

*As a [user], one can simply click in and search for information in a simple way. It is prepared in a readable manner. – Interviewee 2*

*[KULI] makes it clearer to see a simplified analysis. [...] at least to get an overview, it becomes clearer with headings in one picture. – Interviewee 3*

*The data is stable and reliable, it's the biggest advantage. The data can be trusted. – Interviewee 7*

## Reduced time

According to the interviewees, the main benefit of having KULI at hand is that it reduces time spent on finding the information they require to be able to perform at their job:

*[If I would not have access to KULI], I would have to fetch the information somewhere else. I would have been forced to delve into the reports provided by Raindance. KULI makes it easier, not as many steps. – Interviewee 1*

*You need this overview and quick access to information. – Interviewee 3*

*[...] it works very quickly, especially to arrive at details.  
– Interviewee 4*

*The difference is especially time-wise, I would say. It becomes a bit easier to find the information [using KULI] [...]. – Interviewee 8*

## Increased efficiency

The overall picture that the interviews gave, indicate that KULI affects users' efficiency in a positive way. Below, are three quotes explaining this.

*Gathers the information at one place, no need to enter many different systems [...]. – Interviewee 1*

*The tool exist for the purpose of working more efficiently and getting a better decision basis compared to not using [KULI]. – Interviewee 5*

*[Before KULI], the status of different projects was brought to you on paper. More efficient now, when I can find the information on my own [...]. – Interviewee 6*

## 4.2. Fulfillment of key components for successful BI adoption – RQ2

This section aims to answer RQ2 – *From a user perspective, in a post-adoption stage regarding the implementation of BI, what success factors does a higher education institution have difficulties in living up to?* Quotes from the interviews will be analyzed against previous theories regarding key components for successful BI adoption included in the analytical framework. This will be done in order to identify which key components are not fulfilled and try to find the reason for this, as well as aim to provide solutions that increase the fulfilment of key components.

### 4.2.1. Organizational-level

#### Organizational

##### *Strategic alignment*

The overall picture obtained from the interviews regarding the BI tool KULI's usefulness and improvement of organizational processes, is that KULI is useful in several important organizational processes which in turn, should indicate that the purpose of KULI is well thought-out. Below, are three quotes summarizing this viewpoint:

*I have encountered KULI and the reports especially in connection to dialogues with representatives from the faculty [...], the reports are used as a basis for the discussion when talking about the overall financial situation. – Interviewee 3*

*Early warning system [...], the idea behind it was to be able to identify inactive students, those who have not passed the courses and thereby get early signals. This in order to know who to contact, asking – do you need any help? – Interviewee 4*

*If you ask if [KULI] has had an influence on decisions, it has at least influenced what you do and what you follow up. [...] you have a basis to see if you can recruit. – Interviewee 6*

However, according to a few interviewees some processes also lack support from KULI which indicates that there is still room for improvement regarding the strategy for which organizational processes KULI should improve. This viewpoint is illustrated through the two quotes below:

*A tab [in KULI] that has been gone is: staff at an individual level [...]. It is a bit of a pity that the tab is gone. I have been a manager in charge of payroll [...] thus it was a very useful tab in my opinion. – Interviewee 6*

*The [information from the service planning system and KULI] could be integrated in a single system, [...] affects the content and conditions of the business, and reviews what everyone is doing. Capacity utilization is important. – Interviewee 2*

### *IT partnership*

When creating value through the use of BI it is important that an effective IT partnership exists, inside the organization. In that way, feedback from the users can be dealt with in a more efficient way. A majority of the interviewees say that they know who to contact when they want to leave feedback which is exemplified through the three following quotes:

*When something is malfunctioning, when you notice something is wrong, [...] the IT managers or Infotool are contacted. – Interviewee 1*

*Yes, it has occurred that I have provided feedback, because it has happened that I have noticed something is wrong. – Interviewee 6*

*I have asked the [former system owner] about reports. He has explained in detail how the data is retrieved. – Interviewee 5*

Even though most interviewees seem to know who to contact when they want to leave feedback, there are still opportunities for further development in the process for providing feedback.

*Yes, [I have provided feedback] to the system owner. [I have] not had much contact. – Interviewee 2*

*Some kind of forum or user group [for feedback], is missing. – Interviewee 7*

### *Management & leadership*

If the management is not involved and does not support the BI project with sufficient resources, the chance of a successful implementation will decrease significantly. When asking the interviewees about their perception of the managers' view on KULI, they stated that no particular viewpoint, neither negative nor positive, exists. In fact, in many cases, KULI is not something that is being discussed at all.

*They know that it exists. No, they do not [encourage us to use KULI]. Neither negative nor positive. – Interviewee 1*

*As system, it is never mentioned. [We] discuss about budget, actual figures and what the forecast says but not about KULI as a system.*  
– Interviewee 7

In addition to the fact that the system is rarely discussed among the interviewees and the management, the amount of support from the university management also could be better.

*Feels like a tool worth taking care of as well as stimulate and further support from a university management perspective.* – Interviewee 3

## **Technology**

### *Data source/information*

When implementing a BI system, it is very beneficial if the data is easily accessible. Since the interviews only included users of the BI tool and not the developers, this aspect becomes somewhat harder to answer in a detailed way but a few interviewees provided answers indicating that some data may be difficult to obtain. When reading the quote below, it can be assumed that the personnel data stored in the sub-system Primula are not that easily accessible and consequently it hinders KULI from reaching its full potential.

*Sometimes, the [information] is read from the personnel system and sometimes not. I do not think it has been the case [lately], we switched to Primula from another system two years ago.* – Interviewee 2

Furthermore, the following quote describe a situation where the information in KULI is outdated.

*[...] the problem is that the information [in KULI] is out of date. The data [...] has not been updated since [the last] system owner quit.*  
– Interviewee 5

## **Social**

### *Culture around use of information & analytics*

The interviewees were here asked to provide comments about the culture around the use of KULI. Overall, it appears that today more people could make use of KULI. In addition, people expressed opinions that many features of KULI probably are underutilized. This is summarized by the following three quotes:

*Much is underutilized in KULI, I believe.* – Interviewee 3

*I have also noticed that maybe not every head of department uses KULI.  
– Interviewee 6*

*It is probably mixed [positive, neutral, negative]. It varies how we use  
[KULI] in the group. Some have embraced it and use it continuously,  
others do not. – Interviewee 8*

### *Continuous process improvement culture*

In order to make use of BI in a good way, users should be open to adapt and change their ways of working, otherwise a new tool will not be welcomed. The comments received during the interviews indicate that there was a certain skepticism of how useful KULI would be or what need it would fill.

*There is always resistance to change, it is often the first reaction. Then you need a period of time before you get used to it. If you want everyone to use [KULI], a lot of time need to be spent, I think. – Interviewee 8*

*In the beginning, there was resistance to KULI. What are we going to do with that? What is the purpose of it? – Interviewee 4*

## **4.2.2. Individual-level**

### **Technology**

#### *Perceived advantage*

What is the perceived advantage in relation to other sources of information? Most of the interviewees stated that the great advantage of KULI lies in its simplicity regarding the presentation of information and by using KULI you have the opportunity to get a better overview. Below are two of the interviewees' quotes illustrating this.

*Everything I can achieve by using KULI I could have achieved using other applications too, but it is a bit faster and a bit easier [to see the information]. – Interviewee 8*

*Mainly older information that is of interest, that is the advantage [of KULI], [being able to see] multi-year summaries. It cannot be found easily in other systems. Can get a better overview. – Interviewee 5*

However, the users who have access to the original data source (e.g. student information system, financial system etc.) sometimes choose not to use KULI

e.g. when the user is interested in real-time data. Since the information in KULI is updated once every night, there is a certain delay that the user will have to adapt to. Below are two quotes describing this current situation:

*[I choose not to use KULI] when I am interested in real-time information, because it is a night's delay [in KULI]. – Interviewee 4*

*If the courses are about to start, [...] I use [www.antagning.se](http://www.antagning.se). They have real-time information. – Interviewee 5*

In addition, as illustrated through the next quotes, a few interviewees also feel that KULI can be somewhat hard to maneuver and lacks certain useful information. Consequently, they turn to other sources and wish that KULI could be more flexible and modern.

*The information I need is available in other places, e.g. Ladok and [www.antagning.se](http://www.antagning.se), so it depends on what information is needed [...]. The information is available in KULI, but sometimes it is difficult to handle [...]. – Interviewee 5*

*Easier to make forecasts of future expenses in Excel. I do not have permission to change forecasts [in KULI]. The forecasts I have in Excel are much more reliable. My [records in Excel] are more up to date. [...] Would wish the KULI system was more modern, easy to work with and flexible so I did not have to conduct a shadow budget. – Interviewee 7*

### *Complexity*

In order to find out more about KULI's level of complexity, the interviewees were asked to comment on how difficult KULI and its interface is to understand. Later on, when analyzing the interviewees' answers, it became clear that there is a difference of opinion among the users. Approximately one half argue for its simplicity, expressed through the quotes below:

*[KULI] is quite easy to use and interpret. – Interviewee 1*

*The portal [KULI] itself, is relatively simple. – Interviewee 4*

*I think [KULI's interface] is rather intuitive [...]. – Interviewee 6*

*I am not an expert but the system works, it is easy for the task I am doing. – Interviewee 8*



The other half's view is illustrated through the following quotes, where they choose to criticize the way information is being displayed and at the same time point out that a certain learning threshold exists.

*The headlines are created in the world of economists, are interpreted by us, [the users]. Sometimes one would like to have a "twist" or closer specification of the heading. – Interviewee 3*

*[...] [KULI is] difficult to maneuver – it is quite complex, although it is very competent there is a certain learning threshold [...]. – Interviewee 5*

*[KULI's information] is reliable but not always easy to interpret. – Interviewee 7*

This disparity in the results from the interviews can partly be explained to stem from what level of depth or what parts of KULI they use. There are two different levels of KULI, the pre-made presentation of information which is easier and more accessible, and the customized presentation of information where the user can select more detailed or specialized information.

*There are different levels – there are pre-made reports [...], and then you can dive into [the customized section] NetDiver reaching more specific data. When you dive you need to have an understanding for how the tool works. The data is quite complex. – Interviewee 5*

*Should I begin dig deeper, fetch, compile and present the data I want, I would not manage to do that. – Interviewee 8*

## **Motivation**

### *Extrinsic motivation*

Using an application is usually motivated by the feeling that it will help the user achieve better results than not using it would. The motivation to use KULI was discerned from the interviewees to be focused on just this aspect since the respondents often highlighted that it helps them in certain areas or aspects of their work and leads to them being more informed.

*I am curious about how the [operational plan] evolves. I want to make sure that our operation position itself where it should, economically speaking. I use KULI to obtain information [regarding economic condition]. – Interviewee 2*

*Most commonly it is [used for] economic monitoring, to see how we are doing during the year, [...] that is the common [purpose I use KULI for] and also to answer questions. – Interviewee 3*

*I might have to check on specific projects, how much money we have and if the money has been collected [...]. [I use KULI for] monitoring, and to inform colleagues and staff how we are doing, if everything is fine or if we have to save money. – Interviewee 6*

### *Intrinsic motivation*

Another aspect to consider when exploring the motivation behind the use of an application is the question of whether it is enjoyable or pleasant for the user. Otherwise they would rarely open the application since it would be difficult to maneuver. Regarding KULI, the interviewees expressed different thoughts on this subject, some were indifferent to KULI's interface and some brought up both positive and negative feelings. The following quote summarize the positive thoughts on KULI:

*A system like KULI operates in the same way whether you are looking into finance, staff, student, or something else. There is no need to switch [between different systems] since the interface is the same to the user. – Interviewee 1*

The negative aspects of using KULI is more about the fact that it is perceived as ugly and sometimes difficult to use, resulting in being an unpleasant experience. At the same time, even though some think it is ugly, it is believed to be capable of doing its job:

*Pretty ugly. Unstable when using KULI via mobile or iPad. On the PC it is reliable and stable. – Interviewee 7*

*[KULI] needs a facelift. – Interviewee 4*

*It works as it should. It is functional, but not so sexy. [However] It does not have to be that since it fulfills its purpose. – Interviewee 8*

### **Social influence**

#### *Co-workers view of BI*

The interviewees had some positive perceptions of co-workers view of BI or more specifically KULI, however there was a clear consensus of a more neutral view in that people rarely speak about or even discuss KULI. One interviewee's positive perception of co-workers' feelings towards KULI is expressed below:

*[Co-worker's view is] positive. Different how often and how much you use it. – Interviewee 1*

As mentioned earlier, the majority still have a more neutral perception, in which it is not even discussed, neither by praising it or complaining about it:

*Have not talked so much about [KULI]. Not a topic of conversation. Therefore, I do not know what purpose others use it for. – Interviewee 2*

*It is not mentioned very often. – Interviewee 5*

*It is a tool, it is nothing you have opinions about. It is a supportive tool. – Interviewee 6*

*No, it is not something we discuss. Nor is it a system that is constantly being complained about. – Interviewee 7*

### **Situational constraints**

When adopting a new technology there will always be situational constraints that hinder the development and success of the implementation. From the interviews it became clear that this is the case for KULI as well and the situational constraints observed at KaU can be categorized as two major constraints: requisite skills and requisite resources.

#### *Requisite skills*

In order to be able to use BI to its fullest potential, the user has to possess skills and knowledge that will allow that to happen. The thoughts and perception of the interviewees is a bit divided. Some argue that KULI is not insurmountable and that given a bit of time with the system they can use the system adequately. This is summarized by the following quotes:

*Yes [I have sufficient knowledge] and the opportunity to get help from the system owner. – Interviewee 1*

*[KULI's interface] can be learned, it is pretty clear. – Interviewee 3*

While on the other hand some expressed concerns that while they were able to use the system functionally there is still room for improvement and that their skills and knowledge could be enhanced by learning from more knowledgeable personnel. This is exemplified by the following quote:

*I got the [information] I needed [...]. Still, it was not obvious [...] and needed to explore further before I got a grasp of it. If you are [new to KULI], you may need [an introductory] course for one or two days. – Interviewee 5*

### *Requisite resources*

Using a BI application like KULI has also been argued to help the user increase time efficiency, however it still takes away time from other aspects or assignments of the job. The interviewees expressed concerns about how much time is available to actually use KULI in their job. Especially when discussing the part of KULI where the user can customize the displayed information. This is illustrated with the following quote:

*I could learn more about the [customized section of KULI]. [However], you do not have the time to engage yourself that deeply, although it would have been interesting or could have been useful. – Interviewee 2*

An important aspect the interviewees highlighted is the feeling that KULI is not a highly prioritized resource. Multiple interviewees noted that the amount of training in the application was subpar and that it would be beneficial to receive guided courses continuously. However, this view was not unison and some interviewees felt their knowledge is sufficient to feel that KULI can be utilized properly at the moment. Nevertheless, the concern for lack of training exceeds the feeling of being content, which is summarized by the following quotes:

*I believe that users need to be shown the opportunities [KULI offer] when they are new, and maybe a few additional times [...] since when users are new you get overwhelmed [by information]. You need to give it some time and recurring occasions to get accustomed [to KULI] if you want it to be used. – Interviewee 3*

*No [opportunities to attend courses] other than when we had the introductory course. – Interviewee 8*

*[...] has not been time available for [training]. – Interviewee 4*

*I got an introduction to [KULI] in the beginning but it might have been a bit too short. [During my time at KaU] I have used it often enough that I feel I understand it fine. – Interviewee 7*

In addition to the lack of training there were also additional views expressed on the topic of elevating the process of using KULI from being just a tool they use occasionally, to being able to use it in a much more optimal and efficient way:

*How you use [KULI] in a constructive manner, to make it contribute to the work, that part is not supported enough. – Interviewee 3*

Another problem mentioned during the interviews was that there is a lack of accessibility regarding KULI. Not everyone who is interested in using KULI – to aid their processes, even though they might not use it every day – is able to use it:

*One problem is that we do not have enough accounts available. Cannot add everyone who wants access. – Interviewee 5*

## 5. Discussion

### 5.1. Research question 1

*How does Business Intelligence influence the decision-making process at a higher education institution?*

Based on the interviews, it can be concluded that the BI tool KULI definitely has an impact on the DMP. As the result indicate, KULI often works as a supportive tool for finding information that they then use as a basis for decisions. Therefore, it is a clear link to the *intelligence* activity of the DMP (Simon 1977). Even if this is the most obvious link, KULI also indirectly affects the other activities of the DMP, the so called *design*, *choice*, and *review* activities. This since the DMP, according to Simon (1977), is structured as a sequential cycle starting with the *intelligence* activity, resulting in the succeeding activities being affected as well. However, it can be argued that KULI affects the *review* activity directly as well, since if the information displayed is interpreted as the result of previous actions, the user can track the outcome of these actions. Though there is not a clear part of KULI that is assigned to review previous decisions resulting in this connection to be deemphasized. In conclusion, KULI has a positive effect on the *intelligence* activity of the DMP, and will only have an indirect positive effect on the rest of the activities of the DMP through the impact it has on the *intelligence* activity.

When continuing comparing the collected empirics to previous theories on how BI influences the DMP, it was discerned that KULI's impact on the DMP is similar to previous findings displayed in table 1.

Firstly, KULI seems to present information of high quality. This is argued since the interviewees' general view is that the information in KULI is readable, understandable, and reliable. If KULI would be removed they would not be able to access and benefit from this information. This is in accordance with the theory claiming that BI increases the quality of information available in the DMP (see table 1).

Secondly, it seems that with KULI it becomes easier and faster to find the information you are looking for. This in turn, leads to the time to decision being reduced. Additionally, if KULI for some reason would not be available to the users, they claim they would have been forced to search for the information in another manner, with an increased number of steps requiring more time and

effort. This improvement in time reduction matches with previous research displayed in table 1.

Thirdly, according to the interviewees, KULI manages to gather valuable information at one place leading to a more efficient work flow. Thus, the situation at the university is similar to the argument by previous theories stating that BI increases efficiency of the DMP (see table 1).

However, one difference was noticed from previous research. The result does not indicate that KULI provides the user with additional choices or offer more solutions i.e. KULI does not provide particular responses to identified conditions in need of action. What KULI does, is to collect historical data from several systems which are then presented in a favorable way. No further analysis such as predictive analysis, is performed. This fact challenges Hou and Papamichail (2010), who argue that an implementation of a BI system leads to a situation where more choices/solutions are discovered and provided to the user (see table 1).

Moreover, the interviewees did not provide any additional insight that would suggest positive or negative impacts outside of table 1.

To summarize, the empirics show that using the BI tool KULI influences the DMP in accordance with 3 of the 4 improved areas from previous research presented in table 1. At KaU, BI *increases efficiency, reduces time, and increase quality of information* but does not *offer more choices/solutions* to the user.

## **5.2. Research question 2**

*From a user perspective, in a post-adoption stage regarding the implementation of BI, what success factors does a higher education institution have difficulties in living up to?*














The result from the interviews shows that KULI is not being fully utilized in its current state. When comparing the interviewees' responses against the organizational-level success factors by Hasan et al. (2016) it became clear that most of the areas can be improved. Even though the majority detailed that KULI has a positive impact on vital organizational processes, some job assignments that are important processes in their daily work could be better supported. While there is a clear feedback channel for the users, meaning that they know who to contact, the process could see some improvement. This is argued since the users would like to see a simpler way to communicate e.g. some form of a feedback forum. There also seems to be a lack of support and

commitment from upper management, however this did not reflect a negative stance from upper management, only that there is a more sense of KULI as a forgotten or not highly prioritized tool. Regarding the availability of data, the interviewees were not always in a position to offer insight, however a few answers indicate that there is some problem in the gathering or processing of data since not all the information is present and in some cases outdated. There is also a lack of culture around using KULI that originates from it not being a subject of which the users seem to be exchanging knowledge or sharing experiences. There seems to even be some resistance to using the tool or changing the way the user work to accommodate the adoption of KULI.

Regarding the comparison between the result and the individual-level factors by Yoon et al. (2014), the respondents were in unison with the opinion that that the use of KULI is motivated extrinsically, meaning that they consider KULI to facilitate their processes to help them achieve better results. The intrinsic motivation – feeling of KULI being enjoyable – is crippled by the common opinion that it is perceived as ugly and difficult to use, even though it is believed to be a capable tool. In regards to the ability to quickly produce an overview of organizational information it is superior to alternatives. However they can turn to other sources when KULI lacks certain types of information that is not integrated, or when the information is outdated. The responses on KULI's level of complexity varies, partly it feels to be an easy-to-use tool and partly it is regarded as complex when the information sought after needs to be customized for a specific situation. Therefore, sometimes the user relies on more knowledgeable personnel for aid and guidance. As mentioned before, the culture around the use of KULI is mainly non-existent, leading to the view of co-workers to mimic this, i.e. not being a topic of conversation or discussion. The thoughts on the knowledge it takes to use KULI can be summarized to be that that everyone has enough knowledge to use it sufficiently for simple tasks, e.g. see a quick overview of certain information, but when the users want to delve deeper into the information and specify what is shown, the requisite skills and knowledge seems to be insufficient. The training received in this area was felt to be subpar and users expressed a need to receive further training in order to elevate their understanding of KULI and to use it more efficiently, which can be traced back to the support of management. Additional points brought up was the fact that not everyone who is interested in receiving access to KULI is able to do so, nor do users have enough time to fully utilize KULI in their job.



A visual summary of the result is shown in figure 9, where each factor is marked with a color, green for the factor being fulfilled, orange for the factor being semi-fulfilled meaning that while there are some positive results there is room for improvement, and red when the factor is not fulfilled with predominantly negative results and in need of improvement.

<b>Hasan et al. (2016)</b>	Fulfilment	Reason
<b>Organizational</b>		
Strategic alignment		Some vital processes lack support from KULI
IT partnership		The feedback process could be improved
Management & leadership		Seems to be a lack of support and commitment from upper management
<b>Technology</b>		
Data source/information		Some data may be difficult to obtain
<b>Social</b>		
Culture around information and analytics		Lack of strong culture around the use of KULI
Continuous process improvement culture		Some resistance to change and adapting work processes
<b>Yoon et al. (2014)</b>		
<b>Technology</b>		
Perceived advantage		There is a perception that KULI is relevant and displays useful information but it is sometimes discarded for alternatives
Complexity		Static information section is easy to use and understandable. Customized section is considered difficult to navigate
<b>Motivation</b>		
Extrinsic motivation		All of the interviewees consider KULI to facilitate their processes and lead to them achieving better work results
Intrinsic motivation		Both positive and negative perceptions of the enjoyment of using KULI
<b>Social influence</b>		
Co-workers view of BI		Mainly neutral view of BI in which it is rarely even discussed
<b>Situational constraints</b>		
Requisite skills		Divided views: partly sufficient skills and knowledge, partly insufficient
Requisite resources		Users feel like there is not enough resources allocated to the use of KULI: lack of time to use it and a lack of training

Fulfilled  Semi-fulfilled  Not fulfilled 

**Figure 9: The success factors graded based on their fulfillment**

### ***5.2.1. Suggested solution***

From the summary in figure 9, it is concluded that almost all success factors are subjects for improvement apart from the motivational factor. The motivation behind using KULI is that the users believe it offers them better achieved results. Consequently, regardless of the fact that some users consider KULI to be somewhat of an unattractive system, it is not enough to dissuade them from using the tool. Due to this, the conclusion is drawn that even though KULI probably could use a facelift in some form, there are more pressing issues that need to be addressed.

Even if it can be tempting to improve all the semi and not fulfilled success factors simultaneously, it is probably not that wise. Instead, to start with it is better to focus on improving a few factors at a time. In addition, improvements to one factor may lead to another being positively affected in the long run. The fact is that, when examining the whole picture that figure 9 depicts, we argue that most of the factors can see some form of positive development by focusing improvement efforts in three areas: *management & leadership commitment*, *IT partnership*, and *requisite resources*. Between these three factors, *management & leadership commitment* is considered as being the factor where improvements should be achieved first. If the upper management becomes more committed and offer additional support, the other two factors will be able to be improved as well. This is argued similarly to Wieder and Ossimitz (2015) who argue that BI management – managing purpose and strategy; implementation; and support of BI systems – has a positive effect on the scope of BI (number of business functions or processes supported by BI tools). Without the support from management & leadership it will be difficult to find success in improving the other factors, e.g. to try and improve requisite skills is difficult since educating users would involve allocating time and monetary means for trainings.

Hence, the management ought to empower the system owner's ability to implement changes by allocating sufficient time and resources. This action, will in turn allow for the system owner to improve *IT partnership* and *requisite resources*. *IT partnership* should focus on development efforts internally in the form of improving the internal communication between the system owner and the users. There should be a better feedback system where the user easily and with low effort, can communicate problems and ideas for improvement to the people who have the knowledge and resources to actually make changes to the tool.

Regarding *requisite resources*, the efforts should be focused on offering training and guidance consistently, starting at an early stage when the user is new to the system and continue to support the user throughout its period of use. The success of the training sessions is not only decided by the system owner, but by management as well since they have to allocate time for the users to be able to take part in the training.

This three-step suggestion to, (1) empower the system owner to, (2) implement a better feedback system and (3) consistently offer training, will result in positive effects on several factors that need improvement shown in figure 9.

An improved feedback system may show progress in the perceived *complexity* of the system since with better feedback the system's level of complexity in the areas that are considered difficult to grasp can be decreased. Correspondingly, the *perceived advantage* of KULI may see improvement too, since if users can actively influence how the tool functions, areas of KULI that they feel are deficient and that results in users turning to other systems can be enhanced. This includes adding key processes to KULI's influence, meaning that the *strategic alignment* will be affected positively since the purpose of KULI will match better with its performance.

An increase in the amount of training for the users should also lead to a situation where the users to a greater extent, possess the *requisite skills* to use the program effectively and efficiently without needing to receive guidance from expert users.

The combined outcome of developing KULI by adding better opportunities for user feedback and improved user knowledge, should also lead to an increase in the number of users, which would in turn offer more opportunities for interactions. An increase in the number of knowledgeable users that interact and exchange experiences might be able to turn around the lack of *culture of using* KULI towards a more positive culture. An improvement in culture also implies that the *co-workers view* of KULI will change from a neutral view towards a more positive view.

Regarding the two factors not mentioned, *process improvement culture* and *data source/information*, the conclusion is that they will not be affected by this suggested initiative. The *data source/information* is believed to have been outside of the interviewees' knowledge which is why there were very few insights gained in the result. The *process improvement culture* is something that is hard to affect

easily and is considered to be more of an organizational-wide issue, meaning that any efforts in this area would have to be far more extensive.

Most of these effects that the suggested initiative will have is of course conjecture, however they are justified by what we consider to be a fair reasoning based on the result gathered during the data collection.

These suggestions may not be easy to implement considering the nature of a governmental organization (Gang-Hoon et al. 2014), and the fact that the current state of BI at KaU might be believed to be sufficient. However, since the result depicts a picture in which KULI is clearly underutilized and not working optimally, it is a suggestion worth pursuing.

### **5.3. Sustainability**

Elkington (1999) argues that, to act sustainably, organizations need to take into account all of the three factors: economic, environmental, and social, when making decisions and not just focus on the economic growth at the cost of the environment or its employees. The environmental aspect is considered to be outside of this thesis' scope, meaning it will not be discussed. However, as mentioned, the suggested solution will have an economic impact on KaU and additionally, since the focus of the study has been from a user perspective it makes the social aspect interesting as well.

The cost of the suggested development efforts of KULI could be quantified by measuring certain central aspects, e.g. the salary required for personnel in charge of teaching the users, cost of non-working hours when users attend the training, cost of facilities, and time required for improving the internal communication (depending on what this improvement in communication will be, the calculations will alter). To justify an investment of this nature can be considered difficult since the cost would be measured against the benefits. The problem with measuring the benefits, is that financial measurements is usually not in line with the organization's intention of using BI technology (Elbashir et al. 2008). This means that the benefits would have to be quantified in a different way that details how the benefits of the suggested improvement efforts could be measured against the cost. However, this is considered to require much further effort than can be expected to be covered in this thesis.

Regarding the social aspect, the study's result offer an insight into the effect KULI has on the users in that it helps them work more efficiently and save more time in certain aspects of their job. Considering this, it is not too far-fetched to

think that the suggested improvements to KULI would have an even more positive impact on the user's workload. The positive effects KULI has shown to have on the user's DMP by allowing the user to find information easily and in an accessible way in turn, allows the user to more efficiently use their time, and spend less time and energy on finding information. This can be considered to decrease the stress levels of the users, at least in some aspects of their job, hence further improvements to KULI can be seen as a way to make KaU operate in a more socially responsible way.

## 6. Conclusion

### 6.1. Findings

*RQ1 – How does Business Intelligence influence the decision-making process at a higher education institution?*

The outcome of the first research question shows that BI at a HEI has a direct positive effect on the intelligence activity of the DMP and only influences the other activities indirectly by improving the intelligence activity. It was found that BI affects the DMP by increasing the quality of information, reducing time, and increasing the efficiency, hence the findings contribute to the understanding of how BI influences the DMP at a HEI.

*RQ2 – From a user perspective, in a post-adoption stage regarding the implementation of BI, what success factors does a higher education institution have difficulties in living up to?*

The result from the second research question show that most of the key components that increase an organization's chance of a successful BI implementation, are difficult to fulfill completely and can be improved more or less (figure 9). The result points out three areas that are in greater need of improvement: management & leadership commitment, culture around use of information and analytics, and requisite resources.

Furthermore, an example was provided for improving most of the key components included in figure 5 by focusing improvement efforts in a few areas first. It was shown that by focusing efforts in three areas: management & leadership commitment, IT partnership, and requisite resources, most of the remaining factors could see some improvement as well.

### 6.2. Limitations and future research

This study answers the research questions based on a single case study, meaning that the generalizability can be questioned and thus, further research is suggested. Nevertheless, the findings from RQ1 may be generalized to other HEIs since the type of BI used at KaU is based on the same type of underlying platform (supplied by Infotool) that is used at the other Swedish HEIs discussed previously. The study performed by Aziz and Sarsam (2013) suggested further research at other universities and the result shows that there are similarities between their findings and the findings in this thesis. This fact, makes it interesting to continue and investigate at other Swedish HEIs to further confirm BI's impact on the DMP.

KULI is a type of BI tool that has its focus in supplying the user with accessible, understandable, and reliable information from several underlying operational systems. This means that the findings generalizability can be questioned considering the existence of other types of BI tools with additional functionalities or specializations, e.g. BI tools that offer predictive analysis. For this reason, how other types of BI tools affect the DMP is something that is interesting for future investigations.

Regarding RQ2, the findings – which key components that are difficult to fulfill – are tightly connected to the particular setting at KaU and the implementation of KULI, resulting in challenging the transferability to other HEIs or organizations. However, the methods and approach used to identify the key components could be used in future research where comparisons with additional HEIs would be interesting and worth investigating.

The focus of both RQ1 and RQ2 was to investigate these areas from a user perspective. Therefore, the viewpoint of the management and the technical team responsible for the “behind the scenes” work of KULI was excluded. Future research should consider involving these additional groups as well, which we believe could result in offering a broader picture that take into account all the different groups’ views and opinions.

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## 8. Appendix

### A1 Interview guide

Introduction:

- Background of researchers.
- Purpose of interview and consent to be recorded.
- Present how the interview material will be used - transcribed only by researchers, sent out for approval to the interviewee.
- Mention they will be anonymous.

Opening questions:

- What is your job title?
- Primary job assignments?
- How long have you worked at KaU?
- How long have you had this position?

General questions (RQ1):

1. What does business intelligence (KULI) mean to you?
2. BI/KULI
  - 2.1. How do you come in contact with KULI?
    - 2.1.1. What purpose do you use it for?
  - 2.2. How many years have you used KULI?
    - 2.2.1. If used since inception how has KULI affected your job performance compared to before?
  - 2.3. How often do you use it?
3. Decision-making process
  - 3.1. How often do you make decisions (using KULI)?
  - 3.2. How does KULI affect your ability to make decisions?
    - 3.2.1. If so, in what manner?
      - 3.2.1.1. e.g. information gathering, selecting choices
4. Do you have any contact with the technical team i.e. the staff responsible for data warehouse environment?

Issues (RQ2):

5. What motivates you to use KULI?
6. What do you think of KULI's user interface?
  - 6.1. Enjoyable? Difficult?
7. Do you feel you have the knowledge needed to use it?
  - 7.1. If not what is needed?
  - 7.2. If yes what skills prepared you?
8. Do you feel KULI displays relevant information?
  - 8.1. If not, what is missing?
  - 8.2. Did you have any input in the gathering of data?
9. Are there any situations where you choose not to use KULI?

- 9.1. If yes, when? What alternative is used instead?
10. How would you describe the culture around the use of information and analytics?
  - 10.1. How do you perceive managers' view on KULI? Co-workers view?
11. How do you give feedback on KULI?
  - 11.1. Does it work properly according to you?
  - 11.2. If not, what is missing?

Conclusion:

- Do you have any questions for us?
- Are there any questions you feel was excluded?

## A2 Link between success factors and interview questions

Question	Factor for comparison
5	Yoon - Extrinsic and intrinsic motivation
6	Yoon - Intrinsic motivation
6.1	Yoon - Technology (Complexity)
7	Yoon - Situational constraints (Requisite skills and resources)
8	Hasan - Technology (Data source/information)
8.2	Hasan - Organizational (IT partnership)
9	Yoon - Technology (Perceived advantage), Hasan - Organizational (Strategic alignment)
10	Hasan - Social (Culture around use of information & analytics)
10.1	Yoon - Social Influence (Co-workers' view of BI), Hasan - Organizational (Management & leadership)
11	Hasan - Social (Continuous process improvement culture), Yoon - Situational constraints (Organizational learning & growth culture)

### A3 Translated key quotes

Interview 1	
English	Swedish
The first step is to create an overall picture, but I do not [necessarily] make decisions but I make further enquiries if something deviates. I decide to delve deeper based on where it deviates.	I första steget är det att skapa en bild för hur det ser ut, det ger en karta men jag fattar ju inte ett beslut [direkt] men om det avviker måste jag fråga [...]. Där avviker det, då beslutar jag mig för att jag gör en djupdykning [...].
[If I would not have access to KULI], I would have to fetch the information somewhere else. I would have been forced to delve into the reports provided by Raindance. KULI makes it easier, not as many steps.	[om KULI togs bort] Skulle vara tvungen att ta fram informationen. För min del skulle det vara att gröta ner i Raindance och de rapporterna man får ut därifrån. Enklare med KULI, mindre moment [...].
Gathers the information at one place, no need to enter many different systems [...]	Samlar ihop informationen på ett ställe, behöver inte in i många olika [system] [...]
When something is malfunctioning, when you notice something is wrong, [...] the IT managers or Infotool are contacted.	När någonting strular, när man märker att någonting är fel, [...] tas kontakt med IT ansvariga eller Infotool.
They know that it exists. No, they do not [encourage us to use KULI]. Neither negative nor positive.	De vet om att det finns. Nej det [uppmana att använda KULI] gör de inte. Varken negativt eller positivt.
[KULI] is quite easy to use and interpret.	Det är ganska enkelt. Enkelt och lätt att läsa.
A system like KULI operates in the same way whether you are looking into finance, staff, student, or something else. There is no need to switch [between different systems] since the interface is the same to the user.	Ett sådant system som KULI, layoutmässigt tänker det lika oavsett om du är inne i ekonomi, personal, studenter eller annat. Man behöver inte hoppa mellan [olika system], det är samma gränssnitt mot dig som användare.
[Co-worker's view is] positive. Different how often and how much you use it.	[Medarbetarnas syn] Positiv. Olika hur ofta och mycket man använder det.
Yes [I have sufficient knowledge] and the opportunity to get help from the system owner.	Ja [jag har tillräcklig kunskap] och har möjlighet att få hjälp av systemägaren.



<b>Interview 2</b>	
English	Swedish
As a [user], one can simply click in and search for information in a simple way. It is prepared in a readable manner.	Man kan ju som användare bara knappa in sig och leta fram information på ett enkelt sätt. Då är den tillrättalagd på läsbart sätt.
The [information from the service planning system and KULI] could be integrated in a single system, [...] affects the content and conditions of the business, and reviews what everyone is doing. Capacity utilization is important.	Det [information från tjänsteplaneringssystem och KULI] kunde ju vara i ett och samma system i och för sig, [...] påverkar verksamhetens innehåll och förutsättningar, och granskar vad var och en gör. Kapacitetsutnyttjande är ju viktigt.
Yes, [I have provided feedback] to the system owner. [I have] not had much contact.	Ja [jag har gett feedback] till systemägare. Inte haft mycket kontakt.
Sometimes, the [information] is read from the personnel system and sometimes not. I do not think it has been the case [lately], we switched to Primula from another system two years ago.	Eventuellt är det [personalinformation] inläst från personalsystemet och ibland inte. Jag tror inte det har varit det sista [tiden], vi bytte ju till Primula från ett annat system för två år sen.
I am curious about how the [operational plan] evolves. I want to make sure that our operation position itself where it should, economically speaking. I use KULI to obtain information [regarding economic conditions]	Jag är nyfiken på hur det [verksamhetsplanen] utvecklar sig. Jag vill se att vår verksamhet kommer att landa där vi har tänkt oss att det ska, ekonomiskt. Använder KULI för att få fram den informationen [ekonomiska villkor]
Have not talked so much about [KULI]. Not a topic of conversation. Therefore, I do not know what purpose others use it for.	Inte pratat så mycket om det [KULI]. Inte varit något samtalsämne. Därmed har jag inte insyn i med hur andra jobbar med det.
I could learn more about the [customized section of KULI]. [However], you do not have the time to engage yourself that deeply, although it would have been interesting or could have been useful.	Skulle kunna sätta mig in i det [anpassade sektionen av KULI]. Man har inte riktigt tid att engagera sig så djupt, även om det hade varit intressant eller kunde varit bra.

<b>Interview 3</b>	
English	Swedish
[KULI] makes it clearer to see a simplified analysis. [...] at least to get an overview, it becomes clearer with headings in one picture.	Gör det överskådligare att se en förenklad analys. [...] i alla fall för den här helheten, här [KULI] blir tydligare uppställt med rubriker i en bild.
You need this overview and quick access to information.	Man ska ha den här överblicken och kunna ha snabb tillgång till information
I have encountered KULI and the reports especially in connection to dialogues with representatives from the faculty [...], the reports are used as a basis for the discussion when talking about the overall financial situation.	Jag har mött KULI och rapporterna framför allt vid dialoger med representanter från fakulteten [...], de används när man pratar om den totala ekonomin. Då brukar de här rapporterna [med information från KULI] vara underlag för den diskussionen.
Feels like a tool worth taking care of as well as stimulate and further support from a university management perspective.	Känns som ett bra verktyg som man ska vårda och gärna stimulera, understödja mer från universitetsledningen att tillämpa.
Much is underutilized in KULI, I believe.	Mycket är underutnyttjat i KULI, tror jag.
The headlines are created in the world of economists, are interpreted by us, [the users]. Sometimes one would like to have a "twist" or closer specification of the heading	Rubrikerna skapade i ekonomernas värld, ska tolkas av oss [användare] ibland skulle man vilja ha en "vridning" eller precisering av rubriken.
Most commonly it is [used for] economic monitoring, to see how we are doing during the year, [...] that is the common [purpose I use KULI for] and also to answer questions	Oftast är det nog en uppföljning av ekonomi, hur ligger vi till eftersom man kan se under året, [...] det är det vanligaste [jag använder KULI för] och sen för att svara på frågor.
[KULI's interface] can be learned, it is pretty clear.	Det [KULI's gränssnitt] går att lära sig liksom, det är ändå rätt tydligt.
I believe that users need to be shown the opportunities [KULI offer] when they are new, and maybe a few additional times [...] since when users are new you get overwhelmed [by information]. You need to give it some time and recurring occasions to get accustomed [to KULI] if you want it to be used.	Jag tror att man behöver visa användare möjligheten [med KULI] när de är nya och några gånger till kanske [...] för när de är nya drunknar man [i information]. Man behöver ge det lite tid och återkommande tillfällen att jobba in det [KULI] om man vill att det ska användas.
How you use [KULI] in a constructive manner, to make it contribute to the work, that part is not supported enough.	Steget hur man använder det på ett så konstruktivt sätt som möjligt, för att få det att bidra till arbetet, den delen får man inte så mycket stöd eller idéer till.

<b>Interview 4</b>	
English	Swedish
[...] it works very quickly, especially to arrive at details.	[...] det går väldigt snabbt framför allt att få fram detaljer.
Early warning system [...], the idea behind it was to be able to identify inactive students, those who have not passed the courses and thereby get early signals. This in order to know who to contact, asking - do you need any help?	Early warning system [...], tanken var väl att man skulle kunna fånga upp de [studenter] som inte varit aktiva, de som inte tentat av och försöka få tidiga signaler där. På något sätt så att man kan ta kontakt - är det något vi kan hjälpa dig med?
In the beginning, there was resistance to KULI. What are we going to do with that? What is the purpose of it?	Först i början möttes KULI med motstånd. Vad ska vi med det till? Vad har vi för vits med det här egentligen?
[I choose not to use KULI] when I am interested in real-time information, because it is a night's delay [in KULI].	Egentligen så [väljer jag att inte använda KULI] när jag ska ta ut snabb information, eftersom det är en natts fördröjning [i KULI].
The portal [KULI] itself, is relatively simple.	Själva portalen [KULI] tycker jag är relativt enkel.
[KULI] needs a facelift.	Sen behöver den [KULI] ha en ansiktslyftning.
[...] has not been time available for [training].	[...] har varit väldigt ont om tid till det [utbildning].

<b>Interview 5</b>	
English	Swedish
The tool exist for the purpose of working more efficiently and getting a better decision basis compared to not using [KULI]	Verktyget finns för att man arbetar effektivare och får bättre beslutsunderlag jämfört med att inte använda.
I have asked the [former system owner] about reports. He has explained in detail how the data is retrieved.	Jag har frågat om rapporter till [förra systemägaren]. Han har förklarat i väldigt detalj hur den här datan kommer ut. Det var väldigt utförlig feedback.
[...] the problem is that the information [in KULI] is out of date. The data [...] has not been updated since [the last] system owner quit.	[...] det större problemet är att informationen [i KULI] är utdaterad. Datat [...] har inte uppdaterats sedan [förra] systemägaren slutade.
Mainly older information that is of interest, that is the advantage [of KULI], [being able to see] multi-year summaries. It cannot be found easily in other systems. Can get a better overview.	Mer äldre information som är intressant, där den vinsten ligger [med KULI], [kunna se] flerårsöversikter. Det finns inte i de andra systemen på ett enkelt sätt. Kan bättre få en överblick.
If the courses are about to start, [...] I use www.antagning.se. They have real-time information.	Om det är nära inpå kurser, [...] går jag in på antagning.se. Där finns realtidsinformation
The information I need is available in other places, e.g. Ladok and www.antagning.se, so it depends on what information is needed [...]. The information is available in KULI, but sometimes it is difficult to handle [...]	Den informationen jag behöver finns på andra ställen, ex ladok och antagning.se, så det beror lite grann på vad man behöver [få] ut [...]. Informationen finns i KULI också men dels är det svårmanövrerat [...]
[...] [KULI is] difficult to maneuver - it is quite complex, although it is very competent there is a certain learning threshold [...].	[...] [KULI är] svårmanövrerat - det är ganska komplext system även om det är väldigt kompetent så är det viss inlärningströskel [...].
There are different levels - there are pre-made reports [...], and then you can dive into [the customized section] NetDiver reaching more specific data. When you dive you need to have an understanding for how the tool works. The data is quite complex.	Det finns olika nivåer - det finns färdiga rapporter [...], till att man kan dyka ner i NetDiver [customized section] på enskilda data. Där man gör dyken behöver man ha en förståelse för hur verktyget fungerar. Där behöver man kunna en del. Datat är ganska komplext.
It is not mentioned very often.	Pratas inte speciellt mycket om det
I got the [information] I needed [...]. Still, it was not obvious [...] and needed to explore further before I got a grasp of it. If you are [new to KULI], you may need [an introductory] course for one or two days.	Jag fick ut det [informationen] som jag behövde. [...] Trots det var det inte självklart utan behövdes [...] utforskas en del innan jag förstod. Om man är färsk kan man behöva gå en kurs på en eller två dagar.
One problem is that we do not have enough accounts available. Cannot add everyone who wants access.	Ett problem är ju att vi inte har tillräckligt med konton tillgängliga. Går inte lägga till alla som vill ha åtkomst.

<b>Interview 6</b>	
English	Swedish
[KULI] Has felt like a support system that has presented information and that has had an impact on what you do and what you choose to follow up on	Har känts som ett stödsystem som har gett information och som har haft påverkan på vad man gör och vad man följer upp.
[Before KULI], the status of different projects was brought to you on paper. More efficient now, when I can find the information on my own [...].	Då [innan KULI] fick man papper på hur det såg ut i olika projekt [...]. En klar förbättring att jag kan själv gå in och se [...].
If you ask if [KULI] has had an influence on decisions, it has at least influenced what you do and what you follow up. [...] you have a basis to see if you can recruit.	Om man nu frågar om det [KULI] har haft påverkan på beslut, har det i alla fall haft påverkan på vad man gör och vad man följer upp. [...] att man har ett underlag för att se om man kan göra en nyrekrytering och anställning.
A tab [in KULI] that has been gone is: staff at an individual level [...] It is a bit of a pity that the tab is gone. I have been a manager in charge of payroll [...] thus it was a very useful tab in my opinion.	En sådan här flik [i KULI] som har varit borta är personal på individnivå [...] Det är lite synd tycker jag, att man inte har den kvar. Jag har varit lönesättande chef [...] så det var en väldigt användbar flik den delen, tyckte jag.
Yes, it has occurred that I have provided feedback, because it has happened that I have noticed something is wrong.	Ja det har faktiskt hänt att jag tagit kontakt för det har hänt också att jag sett att det varit fel.
I have also noticed that maybe not every head of department uses KULI.	Jag har väl märkt det också kanske att det inte är så att alla prefekter använder KULI.
I think [KULI's interface] is rather intuitive [...].	Jag tycker nog att det [KULI's gränssnitt] är ganska självinstruerande [...].
I might have to check on specific projects, how much money we have and if the money has been collected [...]. [I use KULI for] monitoring, and to inform colleagues and staff how we are doing, if everything is fine or if we have to save money.	Det kan vara såhär att nu måste jag kolla upp hur det ser ut på det där projektet, hur mycket pengar har vi där egentligen, har pengarna hämtats hem? [...] Uppföljning, och för att kunna informera kollegor och personal då om hur vi ligger till, om det är frid och fröjd eller om vi måste vara sparsamma.
It is a tool, it is nothing you have opinions about. It is a supportive tool.	Det är ett verktyg, det är inget som man har synpunkter på utan det är ett verktyg som stöd.

<b>Interview 7</b>	
English	Swedish
The data is stable and reliable, it's the biggest advantage. The data can be trusted.	Det är stabila och pålitliga data, det är största förtjänsten. Kan lita på uppgifterna.
Some kind of forum or user group [for feedback], is missing.	Saknas något slags forum [för feedback], eller användargrupp.
As system, it is never mentioned. [We] discuss about budget, actual figures and what the forecast says but not about KULI as a system.	Nämns aldrig som system. Diskuterar om budget och själva siffror och vad prognosen säger men inte KULI som system.
Easier to make forecasts of future expenses in Excel. I do not have permission to change forecasts [in KULI]. The forecasts I have in Excel are much more reliable. My [records in Excel] are more up to date. [...] Would wish the KULI system was more modern, easy to work with and flexible so I did not have to conduct a shadow budget.	Lättare att göra prognos över kommande utgifter i Excel. Jag har inte behörighet att ändra prognoser [i KULI]. De prognoser jag har i Excel är mycket mer pålitliga. Mina [uppgifterna i Excel] är mer up to date. [...] Skulle önska att KULI systemet var så pass modernt och lättarbetat och flexibelt att jag inte behövde föra en skuggbudgetuppföljning.
[KULI's information] is reliable but not always easy to interpret.	[KULI's information] är pålitlig men inte alltid lätt att tolka.
Pretty ugly. Unstable when using KULI via mobile or iPad. On the PC it is reliable and stable.	Rätt fult det får man säga. Instabilt när man använder KULI via mobil eller iPad. På Pc:n är det pålitligt och stabilt.
No, it is not something we discuss. Nor is it a system that is constantly being complained about.	Nej ingenting direkt vi diskuterar. Det är inte heller något system som man hela tiden klagat på.
I got an introduction to [KULI] in the beginning but it might have been a bit too short. [During my time at KaU] I have used it often enough that I feel I understand it fine.	Fick visning i början men kanske var lite kort. Jag har använt så pass mycket under [min tid vid KaU] så nu tycker jag att jag kan det bra.

<b>Interview 8</b>	
English	Swedish
The difference is especially time-wise, I would say. It becomes a bit easier to find the information [using KULI] [...].	Skillnaden där är framför allt tidsmässigt skulle jag säga. Det blir lite lättare att hitta informationen [med KULI] [...].
It is probably mixed [positive, neutral, negative]. It varies how we use [KULI] in the group. Some have embraced it and use it continuously, others do not.	Det är nog blandat [positivt, neutralt, negativt]. Det är varierande hur vi använder det i gruppen. En del har tagit det till sig och använder det kontinuerligt, andra gör det nog inte.
There is always resistance to change, it is often the first reaction. Then you need a period of time before you get used to it. If you want everyone to use [KULI], a lot of time need to be spent, I think.	Det finns alltid motstånd mot förändringar, det är ofta grundreaktionen. Sen behöver man en tillväpningsperiod innan man säger: men det här var nog inte så dumt. Ska man få genomslag så man vet att alla verkligen använder det [KULI], behöver man lägga ner mycket tid tror jag.
Everything I can achieve by using KULI I could have achieved using other applications too, but it is a bit faster and a bit easier [to see the information].	Allt det som jag gör med KULI hade jag kunnat göra med andra applikationer också, men det går lite fortare och blir lite mer enkelt [att se informationen].
I am not an expert but the system works, it is easy for the task I am doing.	Jag är ingen expert på systemet, men det funkar, det är enkelt för den uppgiften jag ska göra. -
Should I begin dig deeper, fetch, compile and present the data I want, I would not manage to do that.	Skulle jag börja jobba djupare och hämta och själv sätta ihop vilka data jag vill ha och hur det presenteras, det skulle jag inte klara.
It works as it should. It is functional, but not so sexy. [However] It does not have to be that since it fulfills its purpose.	Det funkar som det ska. Det är funktionellt, men är inte så sexigt. Det måste inte vara det för det fungerar för sitt syfte.
No [opportunities to attend courses] other than when we had the introductory course.	Nej [inga möjligheter att gå på kurser], mer än när vi hade grundkursen.

## A4 Informed consent form

### Medgivandeblankett - Formulär för skriftligt samtycke av deltagande

- Business Intelligence and its role in decision-making at institutions for higher education: A case study at Karlstad University

Forskningsansvariga:

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Information om studien:

Studien genomförs inom ramen för ett examensarbete på Civilingenjörsprogrammet i Industriell Ekonomi och kommer utföras som en fallstudie vid Karlstads Universitet (KaU). Det huvudsakliga syftet är att förstå hur *Business Intelligence* (BI) påverkar beslutsprocessen vid ett universitet. Det vill vi göra genom en jämförelse mellan tidigare forskning på området och resultatet från fallstudien. Dessutom ämnar undersökningen identifiera fördelar och nackdelar med ett BI-verktyg, detta från en användares perspektiv.

Studien kommer att vara av kvalitativ karaktär där datainsamlingen sker genom semi-strukturerade intervjuer. Studien inleds med en litteraturstudie vilken följs upp av datainsamling genom intervjuer av användare av *KULI – Karlstads Universitets Ledningsinformationssystem* och avslutas med en utvärdering mot ett analytiskt ramverk.

Målet är att utvärdera upplevda fördelar och nackdelar med KULI ur en användares perspektiv, och komma med rekommendationer på hur eventuella negativa aspekter kan tacklas/förhindras.



Förväntningar på deltagare:

- Deltagaren förväntas delta i en ljudinspelad intervju på 40-60 min. (Om deltagaren motsätter sig en ljudinspelad intervju kan det förfarandet överges och ersättas av realtids-anteckningar på papper i direkt anslutning till intervjun.)
- Deltagaren förväntas i ett senare skede även konfirmera att bidraget tolkats av forskningsansvarig på ett korrekt sätt.
- Ingen belöning utgår.
- Den slutgiltiga rapporten kommer att finnas tillgänglig för nedladdning via DiVA-portalen.

Konfidentiell hantering och datasäkerhet

Vid studiens genomförande kommer Vetenskapsrådets fyra huvudkrav gällande forskningsetiska principer inom humanistisk-samhällsvetenskaplig forskning att iaktas.

Informationskravet – Genom denna medgivandeblankett informeras intervjuobjektet om forskningsuppdragets syfte.

Samtyckeskravet – Deltagaren i undersökningen har själv rätten att bestämma över sin medverkan.

Konfidentialitetskravet – Insamlad data kommer vara anonymiserad och ej användas på sådant sätt att en identitet röjs. Dessutom kommer all insamlad data lagras säkert på lösenordskyddade enheter fram till examensarbetets slut då det raderas.

Nyttjandekravet – Insamlad data kommer endast behandlas av forskningsansvariga i forskningens ändamål.

Begäran om informerat samtycke:

*Jag bekräftar härmed att jag tagit del av formulärets information, blivit underrättad om studiens behov, förstått vad som förväntas av mig som deltagare och samtycker till att delta.*

*Observera: Att skriva på detta samtyckesformulär förbinder inte deltagaren att delta om hen vid ett senare tillfälle önskar dra sig ur. Det vill säga, deltagaren i fråga kan när som helst ta tillbaka sitt samtycke.*

Deltagarens underskrift, med datum:

X

\_\_\_\_\_  
Deltagarens namn

Kontrasignering (forskningsansvarig), med datum:

X

\_\_\_\_\_  
Namn - Forskare1

X

\_\_\_\_\_  
Namn - Forskare2

## **A5 Invitational e-mail**

Hej X!

Vi är två studenter här på KaU som nu inom vårt program nått den avslutande kursen Industriell Ekonomi – Examensarbete (FEAE03). Anledningen till att vi hör av oss till dig är att vi i vårt examensarbete önskar intervjua användare av KULI – Karlstads Universitets Ledningsinformationssystem. Kort sagt, vill vi göra detta för att ta reda på hur användandet av KULI påverkar beslutsprocessen.

Själva intervjun kommer pågå i ca 40-60 min och vara ljudinspelad om inte några motsättningar till detta förfarande finns. Insamlad data kommer vara anonymiserad och ej användas på sådant sätt att Din identitet röjs. Bifogat detta mail finner du även en medgivandeblankett innehållande ytterligare information.

Om du kan tänka dig att delta får du gärna läsa igenom medgivandeblanketten och återkomma till oss via mail så att vi kan bestämma en tid för intervju.

Har du några andra frågor är du varmt välkommen att ställa dem till oss!

Hoppas på din medverkan,

Hälsningar Jacob & Erik

## **A6 Respondent validation e-mail**

Hej X!

Tack återigen för att du medverkade på intervju. Vi har i nuläget tänkt att använda X st citat från vår intervju med dig och tänkte bara kolla att det du sa stämmer överens med hur vi har tolkat det. Har du något att tillägga eller ändra på?

*Citat 1*

*Citat 2*

*etc...*

Mvh

Erik Sjöo & Jacob Persson



