The impact and power of Business Intelligence (BI) on the Decision making process in Uppsala University:

*A case study*

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“Wisdom is dead. Long live information.”

- Mason Cooley
Abstract

Information Systems (IS) is the use of Information Technology (IT). Business Intelligence (BI) is a specific type of IS. A BI system is an information system that uses tools to produce and deliver information. BI has become very important in the recent era as the organizational environments are getting more complex and changing faster than ever before.

Research on BI uses in academia has been somewhat limited so far. Most decisions in a university are made based on large amounts of data from internal and external sources. So, a BI tool is necessary there in operational and strategic decision making, and also to compete well in the global environment which is very important for an international university like Uppsala. We made a case study on the large BI tool at Uppsala University. The tool has been used for more than ten years with around five hundred regular users currently. The system is called GLIS (in Swedish: Generellt Lednings Informations System) for Generalized Management Information System. It would be very interesting to investigate how the adoption of this BI system may influence the decision making process in Uppsala University, and thus it becomes the main purpose of this thesis.

An inductive approach using a qualitative method was used in this thesis. The data collection was carried out by interviewing seven experts at Uppsala University and from some documents provided by them. Techniques from the grounded theory approach were applied for analyzing data. Our analysis shows positive effects of GLIS in Uppsala University with big improvements in decision making. The thesis draws a conclusion that the BI tool does affect the decision making process in UU as decision making activities take less time, provide better quality decisions, and are much easier using the tool. The thesis also suggests some possible improvements of GLIS for a better functionality and more user involvement. For IS practitioners, the thesis shows the power of IS tool in decision making and university management. For the IS research community, the thesis contributes with the extension of existing theory on BI uses in academia.
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Mustafa Nizamul Aziz
Ziyad Sarsam

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Mustafa Nizamul Aziz
# Table of Contents

1. Introduction ........................................................................................................................................... 1
   1.1 Background ......................................................................................................................................... 2
   1.2 Problem ............................................................................................................................................... 5
   1.3 Aim ..................................................................................................................................................... 5
   1.4 Research Questions ............................................................................................................................. 6
   1.5 Methodology ....................................................................................................................................... 7
   1.6 Audience ............................................................................................................................................ 8
   1.7 Limitations and Demarcations ........................................................................................................... 8
   1.8 Definition of Key Terminology ........................................................................................................... 9

2. Research Approach ................................................................................................................................... 10
   2.1 Method Approach .............................................................................................................................. 10
   2.2 Qualitative and Quantitative Research ............................................................................................. 11
   2.3 Data Collection ................................................................................................................................. 13
   2.4 Data Analysis .................................................................................................................................... 19
   2.5 Reporting .......................................................................................................................................... 20

3. Literature Review ..................................................................................................................................... 22
   3.1 Business Intelligence ......................................................................................................................... 22
   3.2 Decision Making Process .................................................................................................................. 27
   3.3 GLIS in Uppsala University ............................................................................................................. 29

4. Empirical Findings ................................................................................................................................... 40
   4.1 Documents ......................................................................................................................................... 40
   4.2 Interviews .......................................................................................................................................... 42

5. Analysis ...................................................................................................................................................... 45
   5.1 General Use of GLIS .......................................................................................................................... 46
   5.2 Benefits of BI system (GLIS) in UU .................................................................................................. 47
   5.3 Personal purpose of using GLIS ......................................................................................................... 48
5.4 Influence of GLIS on decision making process in UU ................................................ 48
5.5 Other comments ........................................................................................................ 50
5.6 Summary of the Analysis ....................................................................................... 52
6. Conclusions ............................................................................................................. 55
7. Final Discussion ........................................................................................................ 58
  7.1 Reflections ............................................................................................................. 58
  7.2 Scientific Perspective ............................................................................................ 59
  7.3 Practitioners Perspective ....................................................................................... 59
  7.4 Ethical Considerations .......................................................................................... 60
  7.5 Possible improvements of GLIS ........................................................................... 60
  7.6 Future Work .......................................................................................................... 61
References .................................................................................................................. 63
Appendices .................................................................................................................. 68
  A. Interview Questions: .............................................................................................. 68
  B. Answers to the Interview Questions ...................................................................... 70
## List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>Model of the research process</td>
<td>7</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Taxonomy of different studies</td>
<td>10</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Taxonomy of Qualitative Research</td>
<td>11</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Relevant situations for different research methods</td>
<td>12</td>
</tr>
<tr>
<td>Figure 5</td>
<td>Forms of interview</td>
<td>17</td>
</tr>
<tr>
<td>Figure 6</td>
<td>Data analysis approach used in this thesis</td>
<td>20</td>
</tr>
<tr>
<td>Figure 7</td>
<td>Evolution of BI</td>
<td>23</td>
</tr>
<tr>
<td>Figure 8</td>
<td>A High-Level Architecture of BI</td>
<td>24</td>
</tr>
<tr>
<td>Figure 9</td>
<td>Data transformation to Knowledge</td>
<td>24</td>
</tr>
<tr>
<td>Figure 10</td>
<td>BI Component Framework</td>
<td>25</td>
</tr>
<tr>
<td>Figure 11</td>
<td>Steps of decision making</td>
<td>28</td>
</tr>
<tr>
<td>Figure 12</td>
<td>Overview of the GLIS portal</td>
<td>30</td>
</tr>
<tr>
<td>Figure 13</td>
<td>A model diagram of GLIS</td>
<td>31</td>
</tr>
<tr>
<td>Figure 14</td>
<td>An alternative model diagram of GLIS</td>
<td>32</td>
</tr>
<tr>
<td>Figure 15</td>
<td>Full time equivalents (fall semester)</td>
<td>34</td>
</tr>
<tr>
<td>Figure 16</td>
<td>Gender indicator of employees in UU, June 2013</td>
<td>36</td>
</tr>
<tr>
<td>Figure 17</td>
<td>Gender indicator of students in UU, June 2013</td>
<td>37</td>
</tr>
<tr>
<td>Figure 18</td>
<td>Detailed gender indicator of undergraduate students in UU, June 2013</td>
<td>37</td>
</tr>
<tr>
<td>Figure 19</td>
<td>Total number of applicants in Pharmacy program in Spring, 2013</td>
<td>38</td>
</tr>
<tr>
<td>Figure 20</td>
<td>History of undergraduate students in UU – All departments</td>
<td>39</td>
</tr>
<tr>
<td>Figure 21</td>
<td>Progress of Interviewing according to SSM</td>
<td>42</td>
</tr>
<tr>
<td>Figure 22</td>
<td>Framework for the impact of Business Intelligence on the decision making process in academia</td>
<td>54</td>
</tr>
</tbody>
</table>
List of Tables

Table 1: Number of applicants to courses planned for autumn 2012 ........................................ 33
Table 2: List of publications per author with level according to “The Norwegian model” .... 35
Table 3: Details of interviewees ........................................................................................................ 44
Table 4: The summary of the Analysis depending on empirical findings................................. 53
1. Introduction

This chapter introduces the topics of BI and decision making process. Also it motivates why it is a matter of interest. In addition, this chapter discusses the research questions, methodology, limitations and audiences of this research.

Information is power. Information Technology (IT) and Information Systems (IS) are being increasingly used in different types of organizations. An Information System is a software intensive system which assembles, stores, processes, and delivers information relevant to an organization or to society, in such a way that the information is accessible and useful to those who wish to use it (Buckingham et al. 1987). Business Intelligence is not just an IS as it has its own unique challenges, those which an IS does not have (Clavier et al. 2012). BI is one type of IS, which this master thesis is concerned about.

Business intelligence (BI) systems are being widely used in organizations recently. Safeer and Zafar (2011) mentioned that with the start of current century BI has become an important and emerging tool, technique and technology in business world. They added that organizations of all types across the globe are adopting BI for promoting business and getting advantage over competitors. An important function of Business intelligence is its use in decision making. Safeer and Zafar (2011) maintained that BI has become more useful for business and BI applications are now available to more employees for decision making.

Business intelligence tools have many benefits and uses. One of these uses is what Lin et al. (2009) argued that the purpose of BI is to provide users with the best possible assistance in the process of decision-making apart from delivering the right information to right person during the right time. In sum, nowadays BI has become very important and widely implemented tool in organizations. Along with other things, it helps in decision making.
1.1 Background

When we closely look at the world around us, we recognize that we are living in a digital world of more tools and technologies than that of the years before. Different organizations nowadays are using Information Technology and Information Systems instead of old working methods like pens, papers, and boards. Through this, organizations simplify their works and make them easier and more effective. Business Intelligence is a special type of IS, which we are interested to investigate.

What does the term Business intelligence mean, and where does the term come from? According to Negash and Gray (2008) the term business intelligence was first used in 1989 by Howard Dressner, then a research fellow at Gartner Group, as an umbrella term to describe concepts and methods to improve business decision making by using fact-based support. The authors added the term resonated with decision support professionals, with vendors, and with general managers. Also they said it was widely adopted and replaced terms like executive information systems. Nonetheless, Negash and Gray (2008) argued BI is an evolutionary term that can be expected to be replaced by other nomenclature as fashions change. We have found that it is also mentioned in different article that, Business Intelligence (BI) derived from the decision-making support technology in 1970s, which later experiences a gradual and complex evolution including Transaction Processing System (TPS), Executive Information System (EIS), Management Information Systems (MIS), Decision Support System (DSS) and other stages (L. Cheng and P. Cheng 2011).

Having discussed the history of Business intelligence, let us now turn to BI definition. We have found many different definitions for BI in different books and articles; this is because there is a lack of crisp and universal definition of BI and DSS (Turban et al. 2011). One definition of BI according to Gartner Group in 1996 which is found in L. Cheng and P. Cheng (2011) “BI is a series of technology or application systems which consist of data warehouse (or data mart), reporting, data analysis, data mining, data backup and recovery components, and which contribute to a better business decision and finally can help enterprises to keep a leading position in the competitive market”. Another BI definition by Negash and Gray (2008) “BI is a data-driven DSS that combines data gathering, data storage, and knowledge management with analysis to provide input to the decision process. The term originated in 1989; prior to that many
of its characteristics were part of executive information systems. Business intelligence emphasizes analysis of large volumes of data about the firm and its operations. It includes competitive intelligence (monitoring competitors) as a subset."

We think that IT and Information systems in general are important for business prosper. This is in agreement with Hawking et al. (2010) as they indicate the significance of IT and information systems in success of business over recent years (Safeer and Zafar 2011). A need of more research to IT systems is recommended. As Rezaie et al. (2011) emphasized that in today’s competitive business environment, significant investment in Information Technology (IT) is becoming an important source of competitive advantage and operational efficiency. And as they written according to Kimberling (2006), companies are implementing tens of millions of dollars at a time to implement Enterprise Resource Planning (ERP) or Customer Relationship Management (CRM) technologies in hopes of achieving dramatic improvements in an organization’s efficiency. In addition in the competitive environment, traditional decision-making approaches no longer meet the requirements of organizations for decision making (Rezaie et al. 2011).

In sum, as IT and Information systems are intensively being implemented and used by organizations, also, as mentioned above that tens of millions of dollars are being spent to implement these systems, a closer research to IT systems is recommended in our point of view. Hence, a case study to a certain BI system is useful to evaluate the power of a BI system. As Business intelligence system is one tool of electronic information systems (Rezaie et al. 2011), and as it is maintained that organizations must make good use of electronic information system tools such as business intelligence (BI) systems to quickly acquire desirable information from huge volume of data to reduce the time and increase the efficiency of decision-making procedure (Rezaie et al. 2011). As it is recommended above to use BI systems in organizations, it is of importance to make a narrow study on real BI system.

As mentioned above that Business intelligence systems have impact on decision making process. Again Tvrdikova (2007) maintained “by incorporating BI solution to integrated information systems we achieve benefit (Laube and Zammuto, 2003): simpler and more quality work of all units involved in decision-making process at all organizational levels ...”
Therefore we need to inspect what is decision making process. According to Turban et al. (2011) “Decision making is the action of selecting among alternatives”. Moreover, Herschel (2011) wrote “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.” BI is an area of good opportunity for research for the points mentioned above. So, it will be very interesting to see the real impact of BI on decision making process in an organization.

Most universities have some type of data management tools. Many universities in Sweden have their own BI or analytic tools. We did not find any published research on the impact of BI tools in academia by searching in Uppsala University digital library, which is connected to a lot of databases. We also had consultation with a librarian from Uppsala University library, but no similar research was found finally. On other hand, we found many studies on BI in profit and business organizations, for example banks.

Lupton (2010) recognized in his article BI as an essential way for educational institutions to assess university processes. Assuming BI has vital roles in performing and assessing University decision making activities, we were convinced that making a case study on a university’s BI system would be a time demanding research topic.

We have searched around and found out that Uppsala University has a big BI system named GLIS. Olsson et al. (2012) mentioned that already in the year 2000, Uppsala University had developed BI tool in-house, then in the year 2006, more feasible alternatives emerged in the market, and one of these commercial products (The Diver Solution) is used and integrated with the existing system. The authors added that the system is called GLIS (in Swedish: Generellt Lednings Informations System) which stands for Generalized Management Information System.

We choose to make our case study on the BI system of Uppsala University. That is because Uppsala University has more than 10 years of experience of GLIS, and IT based tools for extraction and presentation of management information (Olsson et al. 2012). Typical examples in using GLIS are the admission process and the planning of student intake, balancing of students among courses, follow up analysis of educational programs, and the bibliometric analysis of publication data.” (Olsson et al. 2012). As
Uppsala University has a large BI system with around 500 regular users currently (interview with Leif Eriksson, 11-March-2013), the experiences of this users would be very interesting for other public and private organizations. It is also interesting to many to see the power of the BI system, GLIS on different decision making activities in Uppsala University.

1.2 Problem

The tool, GLIS in UU is used for supporting the university management in planning and others. The tool has developed and become more advanced over recent years, and it is being used in all levels of university administrations. “In the beginning, GLIS was aimed at mainly supporting the university management. It was used to inform the annual process of planning and reporting at the central level of the university. With the transfer to the technological platform “The Diver Solution”, it became obvious that the system could be further developed and turned into a cost effective tool to be used for a broader range of purposes. Since then, GLIS has been designed to serve various needs at all levels of university administration.” (Olsson et al. 2012).

Uppsala University is a very big organization; it has very large number of employees and students. It uses GLIS for various purposes; also the university has a long and great experience of using BI tools for management. So it is interesting to make a case study on the whole BI system (GLIS) of Uppsala University to see the overall influence of it on the decision making process in the university.

1.3 Aim

We are living in an era where information is everything. It is the key to all success and profit. It is not a secret that the use of modern technology, especially in the field of Information technology (IT) and Information Systems (IS), provides us the appropriate tools to read, analyze, and access information (Williams and Williams 2007). The information can be interpreted in various ways. In decision making processes in organizations, data is gathered from different systems and sources, which leads to large amount of organizational data. To support decision makers in their decision
making process to make more informed decisions this data needs to be analyzed, distributed, and accessed by the right person, at the right time (Turban et al. 2011). A university always has lots of data of students, staffs, courses, publications, etc. Analyzing these data, the institution has to take a lot of decisions.

Business Intelligence provides the ability for the development and improvement of the decision-making processes (Turban et al. 2011). Most business organizations of all sectors are currently using different BI systems. It is not old days when educational institutions have also started adopting it. BI is blossoming in the business environment and is easily adapted to the educational environment, although there is still no unified approach to using it across higher-education institutions (Green, Rutherford and Turner 2009). The main purpose of this thesis is to investigate how a University can get benefit in decision making process when Business Intelligence (BI) system is obtained in the institution. This thesis will discuss important aspects of Business Intelligence. Then, it will be concentrated on the adoption of BI system in a university.

1.4 Research Questions

Business Intelligence (BI) is an umbrella term that combines architectures, tools, databases, applications, practices, and methodologies (Turban et al. 2011). BI is highly prioritized now in most organizations by the top management. Turban et al. (2011) maintains that BI is still not sufficiently and effectively implemented and exploited for supporting decision makers to reach the desired goals in spite of the fact that Business Intelligence has become a top priority strategy in organizations.

As a relatively new field, BI suffers from a general lack of clarity as to what BI is and what it encompasses (Herschel 2011). For academic institutions, it is relatively more new compared to business organizations. Herschel (2011) also claims that to date the actual coverage of BI in academic journals has been somewhat limited. So, it is interesting to research the influence on decision making process after adopting a BI system in a university.
The ultimate goal of this paper is to answer these following research questions:

1. Why is it beneficial to adopt a BI system in a university?

2. How may the adoption of BI influence the decision making process in a university?

1.5 Methodology

In this thesis, we are making a case study on the BI system in Uppsala University. We will follow an inductive approach using a qualitative method for the research. We will have some personal interviews and documents for collecting data for the study. Then we will use the techniques from grounded theory approach for analyzing data that was collected. Through this way, we will reach our final conclusion. The research process is shown in the following Figure with circles around our chosen strategy or methods.

Figure 1: Model of the research process (Oates 2006, p.33)
In the thesis, we will use method triangulation too. **Method Triangulation** is the study that uses two or more data generation methods in a research project (Oates 2006, p.37). In this thesis as data generation methods, we are using Interviews, and Documents to justify findings and enhance their validity.

### 1.6 Audience

The audiences of this thesis are the Academic institutions that have active Business Intelligence systems and also the institutions that want to use BI systems in future. An institution could gain insights of how a BI system affects the decision making process in the institution. Business organizations also might see how decision making activities could be changed using BI systems. Organizations that implement develop and market BI systems have interests in seeing the user experiences and how the systems have affected decision making.

In the academic world, both researchers and students who have interests in Business Intelligence and related areas might find this thesis interesting to have some more knowledge and understandings on BI uses in educational institutions.

### 1.7 Limitations and Demarcations

Business intelligence has effects on many aspects in an organization. But decision making process is the only thing that we take into account in this thesis on which we will investigate the impact of BI. Our thesis will not deal with the details of internal design and implementation of GLIS, the BI system in Uppsala University, on which we are making a case study research. Some functionalities and overviews of GLIS which are discussed and shown are only on the purpose of making the paper more understandable to the audiences.

A problem we face during the study is that there are not many written documents available on GLIS. We don’t have the permission or account to log in to the GLIS website. So, we can only use it as public where there is very limited access and data available for public in the website.
1.8 Definition of Key Terminology

*Information Systems (IS):* Computer based sub-systems, intended to provide recording and supporting services for organizational operation and management.

*Business Intelligence (BI):* The processes, technologies, and tools that help to change data into information, information into knowledge and knowledge into plans that guide for better and effective decision making.

*Decision Making Process:* The process of making decisions in organizations from fetching data until the final decision.

*GLIS:* A BI tool used in Uppsala University mainly for planning and decision making purposes. GLIS helps the university management in many other fields too.

*Snowball Sampling Method (SSM):* Data sampling strategy, where one interviewee suggests for next suitable interviewee(s) for the research.

*Saturation point:* A level where no new data is obtained from interviewees while collecting data.

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**Chapter summary:** After going through the overview of Business Intelligence and decision making process, we found out that there is a lack in research on BI systems in academia. We have chosen GLIS in Uppsala University as the BI tool to make our case study research. Accordingly, we have made two research questions after finding the research gap. Finally, we have mentioned the proper audiences for this research.
2. Research Approach

This chapter deals with the research method used in this thesis. It describes the method approach, the details of data collection methods, data analysis, and reporting, etc.

2.1 Method Approach

In IS research, there are many ways to do research studies. Järvinen (2008, p.6) showed a tree-structure or top-down approach to show the research methods suitable for a certain class of studies. In the Figure below, we have shown our research path (with arrows) that we are following in this thesis. In our thesis, we are empirically studying some past and present events where we are developing a new theory grounded on the raw data gathered. The path ends with “Theory-developing studies” which include normal case study, multiple case study, content analysis, ethnographic method, grounded theory, discourse analysis, etc (Järvinen 2008). Our research Path is shown below.

Figure 2: Taxonomy of different studies (Järvinen 2008, p.6)
2.2 Qualitative and Quantitative Research

For many years there have been two alternative choices while carrying out social research: Qualitative and Quantitative social research. The quantitative research is more suitable for natural sciences research; measurement, quantification, statistical analysis, and related areas (Robson 2011). The Qualitative social research has a very different approach than the quantitative research.

Kneebone and Fry (2010) mentioned that qualitative research uses words rather than numbers. They maintained that this kind of research takes place in the real world rather than the laboratory, relying heavily on observation. They also mentioned that qualitative research looks at individuals rather than populations and is about trying to understand and find the meaning behind people’s actions, situations and beliefs. Accordingly, in this thesis we are using the qualitative research approach as it matches our research nature.

There are many typologies of Qualitative Research mentioned by different authors over times. Below is an overview of various qualitative research typologies.

![Figure 3: Taxonomy of Qualitative Research (Marshall and Rossman 2006, p.4)](image)
What is the definition of Qualitative research then? Kneebone and Fry (2010) described Qualitative research as-

“Qualitative research focuses on individual people (exploring the reasons they behave as they do) and on specific contexts, interactions and processes. It investigates the meanings of events, as perceived by those affected by them. It asks questions such as “why” and “how”, rather than “how many” and “in what proportion”.”

A research strategy is an overall approach to answering a research question. There are six common research strategies (Oates 2006, p.35): survey, design and creation, experiment, case study, action research, and ethnography. Our thesis research is “How” and “Why” questions based. When “How” and “Why” questions are the focus of the study, there will be three possible types of researches: history, case study, and experiment (Yin 2009, p.11). In the following figure, different methods are shown with relevant forms of research questions and other conditions.

<table>
<thead>
<tr>
<th>METHOD</th>
<th>(1) Form of Research Question</th>
<th>(2) Requires Control of Behavioral Events?</th>
<th>(3) Focuses on Contemporary Events?</th>
</tr>
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<tbody>
<tr>
<td>Experiment</td>
<td>how, why?</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Survey</td>
<td>who, what, where, how many, how much?</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Archival Analysis</td>
<td>who, what, where, how many, how much?</td>
<td>no</td>
<td>yes/no</td>
</tr>
<tr>
<td>History</td>
<td>how, why?</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>Case Study</td>
<td>how, why?</td>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
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Figure 4: Relevant situations for different research methods (Yin 2009)

We are making a case study among other research types to answer our research questions. It is because our research area objects are similar to what Yin (2009) mentioned as “Case study is preferred in examining contemporary context, but when the relevant behaviors cannot be manipulated.”
We need to know what is meant by Case study for getting deeper understanding of it. Yin (2009) defined a case study as-

“An empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. The case study relies on many of the same techniques as a history study, but it adds two sources of evidence not usually included in the historian’s repertoire: direct observation of the events being studied and interviews of the persons involved in the events.”

We need to follow one type of case study among available types in this research. There are three basic types of case studies (Yin, 2009): exploratory, descriptive, and explanatory. We are doing an exploratory case study in this thesis as this type is used to define the questions or hypotheses to be used in a subsequent study (Oates 2006). It helps us understand the research problem deeply. Case studies also vary in their approach to time (Oates 2006, p.144): historical study, short-term or contemporary study, and longitudinal study; whereas we are doing a short-term case study here to check or examine what is occurring in the case now and what is going on.

2.3 Data Collection

Every research needs some data to be analyzed for the sake of drawing conclusion. Different research types accept different types of data, i.e. different data collection methods are suitable for certain research method than others. Therefore we need to find the best suitable data collection methods that support our research method in best way. While Quantitative data is numeric data, Qualitative data is all other types of data, like words, images, sounds, etc. (Oates 2006). In this thesis we are interesting in qualitative data, as we are making a qualitative research and we are not dealing with statistical numbers.

There are many data collection sources in doing case study research. No single evidence source has a complete advantage over all the others in case study (Yin 2009). Yin mentioned that case study evidence can come from many sources. She maintained that the most commonly used sources of evidence are (pp.101-113): documentation,
archival records, interviews, direct observation, participant observation, and physical artifacts.

To gather information using qualitative methods four approaches are typically used. First, the researcher can participate in a setting. Secondly, a researcher can conduct a direct observation. The third and fourth approaches to gather information are personal interviews and analyzing documents and material culture (Marshall and Rossman 1999).

In this thesis, we have chosen to use the documents from Uppsala University on GLIS system and personal Interviews of experts as data collection sources.

Documents are a default data collection method in all research studies that should be used. Also documents could be in many forms. Yin (2009) argued that except for studies of preliterate societies, documentary information is likely to be relevant to every case study topic. Therefore documents analysis is relevant and we will use it in our research. She also mentioned that documentary information can take many forms and should be the object of explicit data collection. Some of the documents she mentioned are: formal studies or evaluation of same case being studying, articles appearing in mass media or newspaper, administrative documents, progress reports and other internal records, agendas, written reports of events, email correspondence, and other personal documents such as diaries, calendars and notes. Yin (2009) also claimed that for case studies the most important use of documents is to corroborate and augment evidence from other sources.

In addition to literature review, we are using interviews as another data collection source, because it is suitable and available method in our research. Yin (2009) also recommended that by stating one of the most important sources of case study information is the interview.

In qualitative inquiry there are several types of sampling strategies, like homogeneous, Theory based, Snowball, Opportunistic, etc (Miles 1994, p.28). Snowball sampling strategy goes most suitably with our research process to make the samples more purposive, rather than random.
Since we are using the Snowball sampling strategy, we need to define it for a better understanding.

“Snowball Sampling Method, or chain-referral sampling, is a distinct method of convenience sampling which has been proven to be especially useful in conducting research in marginalized societies. This method is commonly used to locate, access, and involve people from specific populations in cases where the researcher anticipates difficulties in creating a representative sample of the research population.”

(Cohen and Arieli 2011)

In this thesis we will use SSM (Snowballing Sampling Method) as a data collection strategy because it fits the research method and the research strategy we are using. “SSM is used in both qualitative and quantitative research” (Cohen and Arieli 2011, p.427). We do not know the right persons whom we need to interview and include in our research. SSM is used primarily to access potential interviewees (Cohen and Arieli 2011). It has been suggested that SSM is probably the most effective method to access hidden and/or hard to reach populations (Valdez and Kaplan 1999).

Then we need to know how many interviews we need to conduct before stopping. After reading some documents we found out that there are many methods regarding that. The strategy that suits us here to indicate an end point in collecting data from interviews is the Saturation point finding strategy.

“Saturation is used in connection with iterative studies. Describes the point where analysis of new data is not yielding any new themes or insights. This is the point at which data collection stops.”

(Kneebone and Fry 2010)

We will stop interviewing people when the analysis yields no new findings. So we are following Kneebone and Fry (2010) as he mentioned “Qualitative research demands considerable flexibility. As data collection gathers pace and interviews are carried out, concurrent analysis may identify additional questions or areas for exploration. When the analysis yields no new themes, saturation is reached (provided a range of views has been sampled). At this point, the interviewing is likely to end, and the final number of interviews conducted may be greater or less than the original estimation.
This part of the process must also be written up and explained in any published output.

**Literature**

Literature review is an obvious part in research. Therefore, a literature review part is included in chapter 3 of this thesis. We agree with Marshall and Rossman (2006) as they stated that for every qualitative research study, data on the background and historical context are gathered. They added that this approach can be seen as supplementary to other data collection techniques. They also mentioned that research journal is one of the relevant documents for qualitative research. A disadvantage of using documents stated by the authors is the need for interpretation for the researchers.

There are some steps needs to be followed while examining sources used in research studies. Holme and Solvang (1997) described four steps to examine a source; Observation, Source, Interpretation and Usability. In the first step, Observation, we should acquire us an overview and understanding of all available information related and relevant with the research. In the second step, Source, it is important to determine the document’s author and its trustworthiness. The third step, Interpretation, is the need to understand and analyze what authors are meaning in source. The final step, Usability, is to understand how useful the source is for our research purposes.

In this thesis we believe, we have covered the four steps just mentioned above. For the first step, we believe we have gained a good overview and understanding of available resources regarding the research as we have searched a lot, had consultation with librarians in Uppsala University regarding finding suitable information. We also got support from our supervisor in this regard. The used sources are reliable, since most of the literature sources are published in well known journals and conferences, or are written by famous authors. We also believe that we have covered the last two steps since we believe we have understood the area and the interpretation of the literature. Finally to be more specific, we were intended to include literature regarding BI, decision making, and decision making process.
Personal Interviews

Any data collection method in general has its own strengths and weaknesses. According to Marshall and Rossman (2006) interviews yield data in quantity quickly, possibility for immediate follow up and clarifications, and allowing researchers to understand the meanings that everyday activities hold for people. On the other hand, Marshall and Rossman stated some limitations like interviewees’ unwillingness to answering all questions, the interviewer may not ask questions that evoke long narratives from participants because of interviewer having problems when it comes to understanding certain behavior because of differences in cultures, languages or the interviewer’s lack of skill. Finally, the interviewees can also have reasons for not being truthful.

There are two types of interviews, standardized and non-standardized. We are concerned with the non-standardized interviews which in its case has many types. The Figure below illustrates the different types of interviews and those we are following.

Figure 5: Forms of interview (Saunders 2007, p.313, after adding our interviewees)
A degree of professionalism is needed to remove the lack of standardization of the interview questions which depends on the skill and experience in the interviewer (Robson 2011). If the interview questions have a high degree of standardization, the questions and the order of the questions is the same for all interviews in the research. A commonly made distinction is based on the degree of structure or standardization of the interview (Robson 2011, p.279): fully structured interview, semi-structured interview, unstructured interview. Then Robson has defined semi-structured interview as the interviewer has an interview guide that serves as a checklist of topics to be covered and a default wording and order for the questions, but the wording and order are often substantially modified based on the flow of the interview. We will use semi-standardized interviews in this research since we want to cover certain question areas to get a deeper understanding of BI dominance on decision making in a university. We will use mostly **Open-ended** rather than Closed questions. We have questions starting with ‘what’, ‘how’ or ‘why’ which will encourage the interviewees to provide extensive answers. Closed questions end with very short answers, often either ‘yes’ or ‘no’. We will try to avoid this type of yes/no questions.

Conducting interviews in proper ways is crucial in qualitative research. To conduct our interviews, we will follow the suggested guidelines and recommendations by Robson (2011). It is also essential to take a full record of the interview from notes made at the time and/or from a recording of the interview (Robson 2011). We intend to use the voice recorders from our Phones during the interview as we don’t want to miss important information. We will ask for its permission first. Robson (2011) mentioned that face-to-face interviews offer the possibility of modifying one’s line of enquiry, following up interesting responses and investigating underlying motives in a way that postal and other self-administered questionnaires cannot. He maintained that non-verbal cues, like body language, voice tone, may give messages which help in understanding the verbal responses. To deal with the probable difficulties with interviewing we have gone through several literatures related to BI to be prepared for the interview situation. We plan to contact our interviewees early in the research process to save time later.

We will send the interview questions to our respondents before the interviews are conducted. This is because they can get familiar with the questions and our research. There are also drawbacks using this approach, for instance, respondents may prepare
some answers and we may not get their spontaneous reactions to our questions (Thomas 2004). But we believe that the answers will be more complete if the respondents get the opportunity to prepare in advance.

2.4 Data Analysis

Qualitative data analysis looks for themes and categories within the words people use or the images they create (Oates 2006).

There are several analytic techniques for analyzing case study data. Yin (2009, p.136) has mentioned Pattern matching, Explanation building, Time-series analysis, Logic models, and Cross-case synthesis, etc. In this thesis we are not following any of them exactly. Instead, in similarity with Cheung and Kam (2012) and Ferguson et al. (2011), and as LaRossa (2005) mentioned that the grounded theory methods are not the only way to do qualitative research, but they are a valuable set of procedures for thinking theoretically about textual materials (i.e., intensive-interview transcripts, observational field-notes, historical documents, and so on). We are using the techniques from grounded theory approach to analyze our data from the interviews and the documents.
Below is a graphical overview of how our data analysis approach looks like in the thesis.

![Data analysis approach used in this thesis](image)

**Figure 6: Data analysis approach used in this thesis**

### 2.5 Reporting

It is important to identify the audiences of this research. As we agree with Yin (2009) when she mentioned that case studies have more potential audiences than other types of research; therefore an essential task is to identify the specific audiences for the report.
We will mention some information about the persons we are interviewing after taking their consent for the validity of the research and of the empirical data. Yin (2009) mentioned that the most desirable option is to disclose the identities of both the case and the individuals in case studies.

For making our case study “Complete” as Yin (2009) stated the case study must be “Complete”. We need to fulfill the conditions that Yin (2009) said for a “Complete” case study by mentioning the boundaries of the case study, involving the collection of evidence in the dissertation, and the absence of certain artifactual conditions, for example stopping the research being out of resources or for time limitation, like end of semester. Therefore in accordance to that we will include our interview questions and answers in the appendix part of the report. We will not stop our data collection because of some boundaries, like lack of resources or time limitation.

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**Chapter Summary:** The goal in this research is to develop a new theory grounded on the raw data gathered. Qualitative data analysis and case study research are used as the research methods. The data collection methods used here are interview data, documents about GLIS, and literature review. We will use the techniques from grounded theory approach to analyze our data by comparing the interview data with GLIS documents, then to compare the results obtained with the literature review to reach a final theory.
3. Literature Review

This chapter demonstrates the literature review, the history, definitions, applications and uses of Business Intelligence. The chapter also reviews Decision making process and what factors might be affected by BI in decision making activities. Finally, it describes GLIS and shows some examples of using it.

Literature review is common and very important for any research. Novices may think that the purpose of literature review is to determine the answers about what is known on a topic; in contrast, experienced investigators review previous research to develop sharper and more insightful questions about the topic (Yin 2009). In the following parts, we have included different works as literature reviews or theoretical background on Business Intelligence, Decision making process, and GLIS in Uppsala University for our thesis.

3.1 Business Intelligence

BI is not a matter of luxury now, rather a matter of survival. Going through the historical overview of Business intelligence systems is an important issue to fully understand the topic of BI. “The term BI was coined by the Gartner Group in the mid - 1990s. However the concept is much older; it has its roots in the MIS reporting systems of 1970s. During that period, reporting systems were static, two dimensional, and had no analytical capabilities. In the early 1980s, the concept of executive information systems (EIS) emerged. This concept expanded the computerized support to top-level managers and executives. Some of the capabilities introduced were dynamic multidimensional reporting, forecasting and prediction, trend analysis, drill-down to details, status access, and critical success factors. These features appeared in dozens of commercial products until the mid-1990s. Then the same capabilities and some new ones appeared under the name BI. Today, a good BI-based enterprise information system contains all the information executives need. So, the original concept of EIS transformed to BI. By 2005, BI systems started to include artificial intelligence capabilities as well as powerful analytical capabilities.” (Turban et al. 2011). The figure
below illustrates the tools and techniques related with and contributed to Business Intelligence.

![Diagram of Business Intelligence](image)

**Figure 7: Evolution of BI (Turban et al. 2011, p.19)**

We went through the history of BI, but we did not define in this section above what BI is. According to Rezaie et al. (2011) different researchers have different definitions for business intelligence system. Turban et al. (2011) mentioned that there is a lack of crisp and universal definition of BI and DSS. Other authors likewise maintained that “Today, there is still not a unified and accepted concept of BI” (L. Cheng and P. Cheng 2011). Accordingly, we found the following definitions of BI. Turban et al. (2011) and Rezaie et al. (2011) defined the business intelligence system as “An umbrella term that encompasses tools, architectures, databases, data warehouses, performance management, methodologies, and so forth, all of which are integrated into a unified software suite”. In another literature, BI is defined as “Business intelligence (BI) is a data-driven DSS that combines data gathering, data storage, and knowledge management with analysis to provide input to the decision process. In the following figure, the high level architecture of business intelligence is shown.
Figure 8: A High-Level Architecture of BI (Turban et al. 2011, p.20)

BI tools make use of big data and analyze the data into information. “Business intelligence emphasizes analysis of large volumes of data about the firm and its operations. It includes competitive intelligence (monitoring competitors) as a subset.” (Burstein and W. Holsapple 2008, p.175). Safeer and Zafar (2011) wrote that Business Intelligence is the processes, technologies, and tools that help organizations to change the data into information, information into knowledge and knowledge into plans that guide for better and effective decision making.

As plans lead to better decision making in BI, and because plans come from knowledge, it is necessary to understand the data transformation to knowledge. Below is a Figure that illustrates how raw data can be transformed to information, then to knowledge.

Figure 9: Data transformation to Knowledge (Michalewicz 2007, p.13)
Business intelligence systems can have different components. According to Turban et al. (2011) business intelligence systems should have four major components, a data warehouse, with its source data; business analytics, a collection of tools for manipulating, mining, and analyzing the data in the data warehouse; business performance management (BPM) for monitoring and analyzing performance; and a user interface. We have found many illustrations of BI frameworks. Below is one of them.

![BI Component Framework](image)

**Figure 10: BI Component Framework (Eckerson 2003, p.6)**

It is essential to know the purpose of BI systems in organizations. Lin et al. (2009) claimed that the purpose of BI is to provide users with the best possible assistance in the process of decision-making apart from delivering the right information to right person during the right time.

Since BI assists users on decision making process, and because this study investigates the impact of BI on the decision making process, it is significant to find out which factors in the decision making process are affected by BI systems.

Different authors mentioned different things about the domination of implementing BI on decision making process. Rezaie et al. (2011) mentioned that organizations must make good use of information system tools such BI systems to quickly acquire
desirable information from huge volume of data to **reduce the time** and **increase the efficiency** of decision-making procedure. Turban et al. (2011) mentioned that BI systems improve decision making.

Hou and Papamichail (2010) found out that Intelligent systems contribute in affecting the decision making processes in many different areas, for instance, identifying potential problems faster, making decisions quicker, improving the reliability of decision processes or outcomes, providing alternative solutions, using more sources of information in decision making, engaging in more in-depth analysis, etc.

Rezaie et al. (2011) maintained that BI systems quickly acquire desirable information from huge volume of data which reduce the time and increase the efficiency of decision-making procedure.

We went through the literature review and found out which areas are affected by implementing BI systems in general. Next is to have an overview about the applications of BI systems in different industries to get more practical view of the use of BI systems because we agree with Hamzah et al. (2010) when he said that BI is currently increasingly being use in organizations as one of the decision-making aid for managers.

There are different styles of Business intelligence tools. “Business intelligence systems could have different styles, which depends on its applications” Turban et al. (2011). The authors followed Microstrategy Corporation in distinguishing five styles of BI which are: report delivery and alerting; enterprise reporting (using dashboards and scorecards); cube analysis (also known as slice-and-dice analysis); ad-hoc queries; and statistics and data mining.

Different BI styles mean that there are many applications for business intelligence. McGovern et al. (2006) mentioned that Business Intelligence techniques has many applications for various areas of business like supply chain management, network intrusion detection, privacy and security enhancement, anti-spamming techniques, retailing, finance and business policy making, competitive Intelligence, etc. Furthermore, as BI refers to applications and technologies that are used for gathering, providing access, or analyzing information about a company’s operations (Business
Wire Inc. 2009). And as it is mentioned in the report that business Intelligence systems can help companies have a comprehensive knowledge of the factors affecting their business; for example, metrics on sales, production. Therefore in the published report, it is considered that query reporting and analysis tools, data mining tools, and data warehousing tools are various tools and applications of BI.

There are many BI tools of different categories in the market, some of them are very well known. Some tools are of open sources, others are commercial. Finally, in this part, we include next some of the popular BI tools.

Below is a List of some common BI tools that we have found in Internet.

1. SAS Business Intelligence
2. IBM Cognos Business Intelligence
3. Microsoft BI tools
4. SAP BusinessObjects
5. QlikView BI tool
6. Style Intelligence
7. Pentaho BI
8. Tableau Software
9. WebFOCUS Business Intelligence
10. Jaspersoft
11. Microstrategy BI tool
12. Oracle BI Enterprise Edition
13. Hyperion System 9
14. SAP NetWeaver BI
15. BizzScore EFM Software
16. Board Intelligence Toolkit

3.2 Decision Making Process

Decision Making is a process of choosing among two or more alternative courses of action for the purpose of attaining one or more goals (Turban et al. 2011, p.42). Decision making comprises four principal phases: finding occasions for making a decision, finding possible courses of action, choosing among courses of action, and
evaluating past choices. The first phase of the decision making process - searching the environment for conditions calling for decision called *intelligence* activity. The second phase - inventing, developing, and analyzing possible courses of action are called *design* activity. The third phase - selecting a particular course of action from those available is called *choice* activity. The fourth phase - assessing past choices is called *review* activity. (Simon 1977)

In similarity with Simon (1977); Turban et al. (2011) also have shown some steps of decision making in the following picture.

![Figure 11: Steps of decision making (Turban et al. 2011, p.12)](image)

There are two polar types of decisions, programmed decisions and non-programmed decisions (Simon 1997). The author mentioned that decisions are programmed to the extent that they are repetitive and routine, to the extent that a definite procedure has been worked out for handling them so that they do not have to be treated each time they occur. Then he mentioned that decisions are non-programmed to the extent that they are novel, unstructured and usually consequential. There is no cut-and-dried method for handling the problem because it has not arisen before, or because its nature and structure are elusive or complex, or because it is so important that it
deserves a custom-tailored treatment. The author added, the main reason for distinguishing between programmed and non-programmed decisions is that different techniques are used for handling these two aspects of decision making.

3.3 GLIS in Uppsala University

GLIS is a Business Intelligence system in Uppsala University. It has a user interface for accessing and managing data. GLIS can be accessed through the internet on http://glis.uu.se.

A history about the GLIS system is important to have a complete picture about the system. Olsson et al. (2012) mentioned that Uppsala University had already developed GLIS tool in-house in the year 2000. The authors added that more feasible alternatives had emerged in the market and a commercial product (The Diver Solution) had been used for these purposes since 2006. GLIS was aimed at mainly supporting the university management in the beginning. It was used to inform the annual process of planning and reporting at the central level of the university, then after transferring to the technological platform “The Diver Solution”, it became clear that the system could be more developed and turned into a cost effective tool to be used for a broader range of purposes.

GLIS stands for General Management Information System (in English) and contains data from the university's basic systems in terms of finances, staffs, students, facilities, and publications (http://glis.uu.se, 2013). With GLIS, users can find everything in one place. According to Olsson et al. (2012), the number of GLIS end-users is around 1000 individuals, and they are constantly growing in parallel with an expanding number of data areas. Some users may consult GLIS almost every working day, while others use it seldom.

GLIS is considered to be a business intelligence system, that is because GLIS has techniques that could contribute substantially to management at all levels by making a lot of information available also to non-specialists, i.e. actual decision makers throughout the university (Olsson et al. 2012).
GLIS from a user perspective is basically a portal on the web where users start by choosing an area of interest for example first and second cycle courses and study programmes (Olsson et al. 2012). The authors added, when entering GLIS, people may choose to log in as a registered user or to enter as a guest. As a registered user he/she may have access to personal information confined to his/her own unit that would be inappropriate to present to a broader audience. Registered users have the possibility to choose between using a predefined report or compose their own by the built-in tool ProDiver. Below is the home page of GLIS portal, where there are many tabs that concern different stuffs.

![GLIS portal home page](image)

Figure 12: Overview of the GLIS portal (from the GLIS website)

According to Olsson et al. (2012) and to the data we get from the interviews, GLIS has a built-in tool called ProDiver which is used to combine the different data and generate complex graphs and tables. GLIS functionality is to combine different databases, combine different data, and to display data to users and decision makers. In the GLIS website it is mentioned that ProDiver users can design their own reports and dive deeper in analysis.
After explaining GLIS system, a diagram is added below to illustrate the general overview of GLIS system.

![Diagram of GLIS system]

**Figure 13: A model diagram of GLIS**

It is also possible to use NetDiver instead of ProDiver in GLIS. Below, there is an alternative overview of GLIS using NetDiver. NetDiver is a **web-based** tool, which is very similar to ProDiver that can be used from any platform in contrast to ProDiver that has to be installed on computer.
The admission process

In order to fully understand GLIS, we will go through some examples of how GLIS has used in reality. Olsson et al. (2012) have chosen some examples to go into details about how GLIS is used for monitoring of the students admission process. Further, the authors mentioned that the admission process is accompanied by three types of registrations. Firstly, applications from presumptive students are registered. Then decisions of the university about admissions are registered. Finally, some of the admitted students show up at the university and course registrations are made. At all levels of this process strategic decision making is called for. When it comes to the final decisions on the dimensioning of courses here are several factors to take into consideration. One such factor is how the courses are funded. Funding caps make it important to distribute student enrolments for optimal funding. As funding is provided on a yearly basis, the admission process for courses in the Autumn has to
take into account also the outcome of enrolments of the preceding Spring. The Figure below shows a data that can be used in admission process.

### Table 1: Number of applicants to courses planned for autumn 2012 (Olsson et al. 2012)

<table>
<thead>
<tr>
<th>Strategic considerations</th>
</tr>
</thead>
</table>

Another example of uses of GLIS mentioned by Olsson et al. (2012) is the strategic considerations. To support Faculty boards on strategic matters GLIS contains several reports to monitor and evaluate at faculty level. Particularly, reports with outcome to date compared to the corresponding outcome preceding years and reports with the actual outcome compared to applied plans are frequently accessed. A Figure is added below for having a better understanding.
Figure 15: Full time equivalents (fall semester) accumulated 26 of July 2012 compared to the same for 2011 (Olsson et al. 2012)

Bibliometric data

Olsson et al. (2012) mentioned a third example about GLIS uses as bibliometric data. Because Sweden has no national system with publication data equivalent with the Norwegian for example, Uppsala University has to rely on the local repository called DiVA. DiVA, from the beginning, was created to support the publishing of doctoral theses electronically but later also served as a publishing database where researchers can register references to all their publications as well as deposit full-text articles. DiVA has been sold to some 30 other universities in Sweden and Norway and is the most used system for storing scientific literature in Sweden. The main input in DiVA besides self-registration comes from Web of Science. Every month, all records with the affiliation of Uppsala University are downloaded from WoS into DiVA and the authors addresses are verified by the library staffs. The same goes for self-registered records and therefore DiVA holds validated records which can be used for bibliometric purposes. PubMed and the National Swedish Library Catalogue, LIBRIS are two other databases from which researchers can download their records. Finally the records from DiVA are transferred into GLIS on a daily basis. The figure below illustrates this scenario.
Every researcher can check their records and make corrections before the final calculations are being done and records that do not get a match against the Norwegian list are being re-checked. This means that the process of handling publications are totally integrated in the management system and the fact that authors are able to check their publications guarantees transparency as well as validates data of high quality which can be used for further analysis. (Olsson et al. 2012)

### Gender indicators of Uppsala University

Another example of using GLIS is providing different gender indicators in Uppsala University. Equality Indicator is a self-assessment instrument to facilitate gender equality, but also provides easily accessible information on the gender distribution of the university.

We found some description from GLIS website that the indicators are statistical measures that show the gender distributions among staffs, graduate students, and students in ten key areas of the university: leadership, professional groups, employment relationships, parental leaves, sick leaves, and activities for students, supply of graduate students, post graduate degrees, registered students, and undergraduate degrees. The indicators can quickly get pictures of the gender distribution.
distributions in different areas of departments, faculties and disciplines and show the developments over the past years.

Below is a recent gender indicator for Uppsala university employees, as the pointer on the red area indicating that there is unbalance in genders among the employees. [Ledning = ‘management’, Yrkesgrupper = ‘occupational groups’, Anställningsförhållanden = ‘Employment conditions’, Föräldraledighet = ‘parental leave’, sjukfrånvaro = ‘sick leave’].

![Gender indicator of employees in UU, June 2013 (from GLIS website)](image)

Figure 16: Gender indicator of employees in UU, June 2013 (from GLIS website)

Another gender indicator below is the student gender indicator where the indicator on green area means that both sex are within some good range, while the yellow area means the situation is acceptable but a bit critical.
Figure 17: Gender indicator of students in UU, June 2013 (from GLIS website)

Figure 18: Detailed gender indicator of undergraduate students in UU, June 2013 (from GLIS website)
It is also possible to select any specific indicator to get more details about it as in the Figure above. Here users can find the total number of undergraduate students, how many of them are male and female, also in percentage mode, and many other related information.

**Undergraduate and graduate levels**

One more last example of the uses of GLIS is the information about students at undergraduate and graduate levels. In the GLIS website, it is written that each night student’s data is retrieved from Uppdok, admissions data from Nya, and some courses data from Selma. Therefore, with GLIS it is possible to fetch fresh and different information about students.

One example we chose from GLIS in the Figure below is the Total number of applicants in Pharmacy program in Spring semester, 2013.

![Figure 19: Total number of applicants in Pharmacy program in Spring, 2013 (from GLIS website)](image)

A final opportunity that GLIS can provide among many others is that GLIS also saves data that can be used in future. So it is possible to make graphs from all historical data. The information can be displayed in different ways, one example is shown below.
Figure 20: History of undergraduate students in UU – All departments (from GLIS website)

The examples above are just some functions of GLIS and different ways of displaying data. Also all data in GLIS is possible to be obtained in .pdf format and in excel sheet as well.

**Chapter summary:** In this chapter, we went deeply through BI history, and the different definitions of it. Also we mentioned some applications and uses of BI systems. In addition we described what decision making process is, and we found out the possible factors affected by BI systems. Finally, we described GLIS broadly and gave some examples of its uses.
4. Empirical Findings

This chapter includes our empirical findings; i.e. the data obtained from the documents we found, and the data from the interviews we conducted. These data will be analyzed in the next chapter.

4.1 Documents

In this thesis, we have used the following written document and website as data collection sources.

- Decision support for the academia at Uppsala University by Olsson et al. (2012)
- https://glis.uu.se/DivePort

Documents are a source of data and can be divided into two types (Oates 2006, p.233): found documents, and researcher-generated documents. Found documents are those that exist prior to the research. We have used the paper titled “Decision support for the academia at Uppsala University” as found document, got from Leif Eriksson, one of our interviewees. We have also used our field-notes, logs, diaries, diagrams, stories, etc. as researcher-generated documents for the purpose of the research task.

As sources of data, apart from textual documents, there are also multimedia documents which include (Oates 2006): visual sources, like pictures, photographs; aural sources, like sounds, music; and electronic sources, like screenshots, websites, etc. In this thesis, we have used the Website of GLIS as a multimedia document for the electronic data.

Some typical examples of how GLIS is used in the management of several processes, which are mentioned by Olsson et al. (2012), are the admission process and the planning of student intake, balancing of student load among courses, follow up analysis of educational programs, the bibliometric analysis of publication data, etc.
Olsson et al. (2012) also mentioned that GLIS from a user perspective is basically a portal on the web where the users start by choosing their area of interests.

Today GLIS has grown up and becomes a large database. As we found that Olsson et al. (2012) described GLIS as it today incorporates data from 11 different databases, and in addition to several reports which are based on data extracted directly from Excel documents, the result is a data depository of more than 10 Tbyte giving rise to more than 300 predefined reports or diagrams presented in the web portal. The authors also added that on top of this there are numerous reports and tables produced by end users on the fly, and some of these reports are saved in individual deposits where they are automatically and continuously updated. Also they mention that several reports are scheduled to be delivered by mail to various recipients.
4.2 Interviews

Selection of Respondents

Regarding selection of respondents, firstly we were guided from our department to meet Leif Eriksson in planning division, Uppsala University. Then according to Snowball Sampling Method (SSM), we conducted our other next interviews one by one with concurrent analysis. Below is a graphical overview of our progress of interviewing in this thesis and the Saturation point where the interview process stops as the analysis yields no new findings or themes. As we reached our expected saturation point, we stopped our interviewing part there. This is shown in the following figure.

![Figure 21: Progress of Interviewing according to SSM](image)

Below we include a table that contains information about the interviewees. The interviewee names are sorted according to the interview dates. We include the related information about each interviewee, i.e. role, place, interview form, and the interview date.
<table>
<thead>
<tr>
<th>Person Name</th>
<th>Role</th>
<th>Place</th>
<th>Interview Form</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leif Eriksson</td>
<td>Analyst at Planning Division, <em>Planning Division</em></td>
<td>Planning Division, <em>Planning Division</em>, <em>Uppsala University</em></td>
<td>Face-to-face interview</td>
<td>24 April 2013</td>
</tr>
<tr>
<td>Joakim Löfkvist</td>
<td>Controller at Planning Division, <em>Planning Division</em></td>
<td>Planning Division, <em>Planning Division</em>, <em>Uppsala University</em></td>
<td>Face-to-face interview</td>
<td>1 May 2013</td>
</tr>
<tr>
<td>Mats Olsson</td>
<td>Analyst at Planning Division, <em>Planning Division</em></td>
<td>Planning Division, <em>Planning Division</em>, <em>Uppsala University</em></td>
<td>Face-to-face interview</td>
<td>9 May 2013</td>
</tr>
<tr>
<td>Björn Wiberg</td>
<td>Technical system administrator at IT Division, <em>Office for operations</em>, <em>Uppsala University</em></td>
<td>IT Division, <em>Office for operations</em>, <em>Uppsala University</em></td>
<td>E-mail interview</td>
<td>14 May 2013</td>
</tr>
<tr>
<td>Michael Petrén</td>
<td>Project manager at IT Division, <em>Office for operations</em>, <em>Uppsala University</em></td>
<td>IT Division, <em>Office for operations</em>, <em>Uppsala University</em></td>
<td>Face-to-face interview</td>
<td>17 May 2013</td>
</tr>
<tr>
<td>Name</td>
<td>Position and Affiliation</td>
<td>Interview Details</td>
<td>Date</td>
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<td>-----------------------</td>
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<tr>
<td>Anna Hagborg &amp; Ewa Holmqvist Jaberi</td>
<td>Senior faculty administrator at Faculty Offices, Office for Humanities and Social Sciences &amp; Fakultetshandläggare utb. vet. fak. at Faculty Offices, Office for Humanities and Social Sciences</td>
<td>Face-to-face interview</td>
<td>21 May 2013</td>
<td></td>
</tr>
<tr>
<td>Krister Ågren</td>
<td>Analyst at Planning Division, Planning Division</td>
<td>E-mail interview</td>
<td>11 June 2013</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Details of interviewees

In appendix part, all the interviews are transcribed. The interviews, along with the other documents, are used for analyzing and answering the research questions.

Chapter summary: In this chapter we have shown our progress of interviewing and listed the details of the interviewees. We had a written Article and the GLIS website as documents. In addition, we had five face-to-face and two e-mail interviews to generate data.
5. Analysis

This chapter discusses the method we are following while analyzing our data, and the details of the data analysis process.

According to Jorgensen (1989), a definition of qualitative analysis is: “Analysis is a breaking up, separating, or disassembling of research materials into pieces, parts, elements, or units. With facts broken down into manageable pieces, the researcher sorts and sifts them, searching for types, classes, sequences, processes, patterns, or wholes. The aim of this process is to assemble or reconstruct the data in meaningful or comprehensible fashion” (Cited in Boeije, 2010).

Grounded theory approach

The history of development of grounded theory is complex. The theory was proposed by Glaser and Strauss (1967) as an inductive approach to generate theory from Qualitative data. Glaser and Strauss then developed grounded theory in different ways in books and article: Glaser (1992), Strauss (1987), Strauss and Corbin (1994, 1997, 1998) (Cited in Oates 2006). Many other authors have given their own views about the theory. Grounded theory was described by Strauss and Corbin (1998) as a theory that was derived from data, systematically gathered and analyzed through the research process. Data collection, analysis and eventual theory stand in close relationship to one another. They added that a researcher does not begin a project with a preconceived theory in mind unless his or her purpose is to elaborate and extend existing theory; rather the researcher begins with an area of study and allows the theory to be emerged from the data. Strauss and Corbin (1998) mentioned that, because Grounded theories are drawn from data, are likely to offer insight, enhance understanding, and provide a meaningful guide to action.

Strauss and Corbin (1998) described in their book how to analyze the empirical data. They mentioned three phases of coding and some techniques to do that. They suggested starting analysis through microscopic examination of data, which is also
called line-by-line analysis. The authors mentioned that this is necessary at the beginning of the study, as it is time consuming, to generate categories and to suggest relationships among categories. Also they recommended using the two operations in analysis, asking questions and making comparisons, which are essential in the development of theory. The authors also mentioned some analytic tools that help in data analysis.

Strauss and Corbin (1998) described the three coding phases: open coding, axial coding, and selective coding. The first coding phase is to start analyze with is Open coding, through which concepts are identified and their properties and dimensions are discovered in data. Strauss and Corbin (1998, p.102) described open coding as a procedure where “the data are broken down into discrete parts, closely examined, compared for similarities and differences, and questions are asked about the phenomena reflected in the data”. The second phase is to use the Axial coding which is the process for relating categories to their subcategories, and the third phase is the Selective coding which is the process of integrating and refining a theory, i.e. building a theory. LaRossa (2005) also divided coding into the same three phases that Strauss and Corbin (1998) suggested, namely open coding, axial coding, and selective coding.

In this study, we intend to follow certain procedure of data analysis to analyze our empirical data. We have understood the grounded theory approach well and its coding phases, and the above mentioned techniques through which we will reach a conclusion. In the next parts, we are going to discuss the major points regarding our analysis based on the data we got from the interviews with experts at Uppsala University and from the documents we got regarding GLIS.

5.1 General Use of GLIS

GLIS is the main and general information system in the university. It has many uses at Uppsala University. In acceptance with what Olsson et al. (2012) mentioned “GLIS has been designed to serve various needs at all levels of university”, GLIS can be used at many different levels and for various tasks. Firstly, it is used in analyzing almost every aspect of the university activities, which was mentioned in the interview with Eriksson. He said, “GLIS is used to analyze all activities within the university”.

46
Secondly, it is used to make follow-ups, which was maintained in the interviews with Eriksson, and with Hagberg and Holmqvist. Thirdly, it is used as a ground for decision making as GLIS combines data from different systems. Löfkvist claimed that GLIS combines different systems in it, and it is used to generate nice looking reports. Finally, it is used as a data collector system as Ågren claimed that GLIS collects data from many different sources (mainly databases) and presents these data on a single site.

As a result, GLIS is used as a general and the most important system in the university. It acts as a data repository, a follow up system, and a nice complex reports generator used as aid for decision making.

5.2 Benefits of BI system (GLIS) in UU

GLIS, in Uppsala University, is beneficial in different ways as it has many functions. Firstly, GLIS combines data from many different systems according to Eriksson and Ågren, so it acts as a main data management system. Secondly, with GLIS the university personnel can do almost anything as Eriksson said that GLIS is a general and intelligence tool that can be used to generate reports, compare data, storage historical data, and many others things. Thirdly, GLIS does simplify administrative processes according to Petrén. This is because GLIS does digitize almost everything and GLIS has the functionality to simplify and present complex things to users, for example presenting things in form of tables and graphs. Fourthly, it acts as indicator for university activities as Hagborg and Holmqvist mentioned. This is because GLIS is the main and only indicator for the status of the university activities. Fifthly, it gives the ability to dive deeply into data according to Wiberg. That is because GLIS combines data from many sub-systems and has the ability to combine these different data together to make something more useful.

In summary, GLIS has different uses in Uppsala University, and it is a main tool that university personnel depend on in doing many of their tasks. It is a huge support to the university management and the planning division.
5.3 Personal purpose of using GLIS

Olsson et al. (2012) claimed that GLIS turned into a cost effective tool that has been used for a broader range of purposes. Therefore, GLIS has different uses at different levels and positions. According to the interview with Eriksson, he uses GLIS mainly for publications reports and anything related with them, like reports on finances and other similar information.

Löfkvist uses everything in GLIS, as he is responsible for making the university annual reports, which needs to have all types of data. According to Olsson, he has a use for all of GLIS tasks, as he is the designer of the system, and his work position in the university was as an analyst.

For Petré, his purpose of using GLIS is looking to the administrative processes. According to Hagberg and Holmqvist, they use it mostly for student admissions and finance reports, and also for monitoring the number of PhD students and gender issues. For Wiberg, he uses it mainly for gender indicators of Uppsala University. Ågren maintains the system and use it for his own analysis.

Hence, we can see that GLIS has various uses in diverse levels. It can be used as a data repository, report builder, historical data storage, and so on. Interviews findings show that some are using GLIS daily, others use it weekly or monthly and that is depending on the person’s Job position, tasks and needs of data from GLIS. Thus we notice that all use and depend on GLIS in some or many of their tasks.

5.4 Influence of GLIS on decision making process in UU

Firstly, we would identify what the meaning of the words affect and influence are. In this study we have interpreted Influence as: the capacity to have an effect on the character, development, or behavior of someone or something, or the effect itself. And we have interpreted Affect as: having an effect on or make a difference to something or someone. So, influence is more powerful word and it has a more influencing or changing power, rather than affect which make more simple and indirect changes.
After analyzing the data we got from interviews, we found some interesting findings regarding the influence of GLIS on the decision making process in Uppsala University. Löfkvist mentioned that GLIS is extremely influential on the decision making process, but on the other hand the other interviewees mentioned the opposite of that, by claiming that GLIS has no influence on the decision making rather it affects it in some ways. For example, Eriksson said that GLIS has no influence on decision making process; instead it acts as a tool to collect and supply the good basic data for the management. Another example is what Olsson told, “GLIS should affect decision making process instead of influencing it because GLIS of course has no agenda to influence the decision making”. Also Hagborg and Holmqvist commented that, “It is more accurate to say ‘affects’ than ‘influences’ as GLIS is not the only base for decision making.”

We believe that GLIS is a tool that has no influence on decision making, rather it affects the decision making process. And we discard the answer of Löfkvist mentioned just above, because the majority of respondents mentioned the opposite, plus he has a short experience in using GLIS, which is one year, while all the others has many years of experiences in using GLIS. Furthermore, the others had a rational explanation of why GLIS does affect and not influences decision making process in Uppsala University.

But how GLIS affects the decision making process in the university and which aspects are affected is analyzed in the next part.

According to Eriksson, when he argued regarding the effects of GLIS on decision making, GLIS is just a base. He said that the basic Figures are calculated in more secure ways. He maintained that GLIS gives a faster way to have basic data. GLIS gives a better data quality in comparison of that without it. Also it makes the work much easier. So, according to him, GLIS acts as the decision making base. It also speeds up the whole process. Decision making works can be much easier with GLIS, and faster decision process is a result of using GLIS. In accordance to Löfkvist, as employees can access data directly from GLIS, it would positively influence the decision making process in time. Also he mentioned that GLIS leads to better information quality. So to him, time and quality of data which will affect decision quality, are affected by GLIS.
Olsson maintained that GLIS does certainly affect the decision making process in time and quality. Olsson strengthened that in an example how GLIS does affect the decision process–“with GLIS I can find many things in 5 minutes which took me several days before and also now with GLIS you can find out things that you dreamed for before, so time and quality are evident.” Petrén also agreed on that by saying, “without GLIS you do not have access to combine and collect data from their resources, so GLIS affects decision making process in many ways: time, complexity, and decisions quality”. Hagborg and Holmqvist emphasized that GLIS is perfect for them in the areas of time, quality, and ease. Also Ågren supported that by commenting that GLIS affects in the factors of time and ease, and it would be very hard and time consuming if you use a lot of different data sources. Ågren agreed on the fact that GLIS do positively affect decision making process minimizing analysis time and making better analysis and decisions, as he mentioned that GLIS cuts analysis time greatly when data is presented in an “easy-to-use” way. But he also maintained that people have a tendency to over-analyze things when data is easily accessible.

In conclusion, GLIS does affect the decision making process in Uppsala university as decision making activities take less times, provide better quality decisions in much easier ways using GLIS.

5.5 Other comments

As the thesis goal is to discover the impact of GLIS on the decision making in UU, we believe that the user satisfaction of the system and the affectivity level of the system according to the users perspective are also indicators of GLIS affectivity on the decision making process. Therefore, we included these questions in the interviews, and we analyzed them to complete and clarify the whole answer to the research goal.

All the interviewees were very pleased with GLIS, and they had a high satisfaction with the system. Eriksson said that he was very pleased with GLIS. Löfkvist mentioned that he had a general satisfaction with GLIS. Olsson imposed that he was very satisfied with the system, while Wiberg added that he was very impressed with this BI system. Petrén also maintained that he was totally satisfied with GLIS. Hagborg and Holmqvist agreed that they were happy with the system too.
Regarding the interviewees opinion of GLIS affectivity on decision making, the general results are that most the interviewees, Eriksson, Löfkvist, Olsson, Wiberg, Petrén, Hagborg and Holmqvist and Ågren, thinks that GLIS has a high level of affectivity on the decision making in UU. Even though, Hagborg and Holmqvist mentioned that GLIS sometimes has less or no affectivity on decision making in the university as sometimes there are other factors that can influence decision making in the university even more than the Figures from GLIS, for example what the government says. These factors make GLIS less effective then. We conclude that GLIS has its power on decision making but it is not the only tool that is used to make the decisions in the university, rather there are some external factors that affect the decision making as well.

Therefore, GLIS has a positive impact on the decision making process in Uppsala University, and the users satisfaction of the system and their opinion of its positive affectivity on the decision making are signs of supporting our conclusions of the analysis results that we have obtained.
### 5.6 Summary of the Analysis

<table>
<thead>
<tr>
<th>General use of GLIS</th>
<th>Leif Eriksson</th>
<th>Joakim Löfkvist</th>
<th>Mats Olsson</th>
<th>Björn Wiberg</th>
<th>Michael Petrén</th>
<th>Anna Hagborg &amp; Ewa Holmqvist</th>
<th>Krister Ågren</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Gender indicator&lt;br&gt;- Age standard&lt;br&gt;- Sick leave&lt;br&gt;- Economy system&lt;br&gt;- Budget&lt;br&gt;- Student system&lt;br&gt;- Courses, exams, and others</td>
<td>- A general system that combines facts and Figures from different kind of systems&lt;br&gt;- The system can be used as a ground for decision making&lt;br&gt;- The system makes easy-to-understand reports and stuffs like that</td>
<td>- Can be used in so many different levels and supports different interests&lt;br&gt;- Support the annual reporting&lt;br&gt;- The only place where economy administrators can pick the budgets or planning numbers together&lt;br&gt;- Very useful for calculating the university premises costs&lt;br&gt;- Sends letters digitally</td>
<td>- Not answered</td>
<td>- Not answered</td>
<td>- Planning and making prognoses&lt;br&gt;- Making follow-ups&lt;br&gt;- Economic tool</td>
<td>- Collecting data from many different sources, and presenting them on a single site.&lt;br&gt;- Can be used in everything from analysts in central positions to scientists who want to keep track of their projects funding</td>
<td></td>
</tr>
<tr>
<td>Benefits of BI system (GLIS) in UU</td>
<td>- Much shorter time</td>
<td>- Possibility to make better decisions&lt;br&gt;- People can get facts and Figures directly from GLIS without asking others to do it manually</td>
<td>- Data repository and data management</td>
<td>- Gaining understanding of where the numbers come from&lt;br&gt;- Offers the ability to drill</td>
<td>- Simplify administration processes</td>
<td>- Only indicator of how things really are at specific moments</td>
<td>- Providing an overview of many different kinds of data which is very hard to do and very time consuming when</td>
</tr>
</tbody>
</table>
down into the data.

| Personal purpose of using GLIS | - Finance  
- Allocation models  
- Publications data  
- Others | - For everything as he use it for annual reports | - All the mentioned things as he is the designer and was an analyst of the system | - Not answered 
- Administrative processes | - Numbers of PHD students  
- Gender reports  
- Student admissions  
- Finance reports. | - GLIS maintainer  
- Own analyses |
|---|---|---|---|---|---|---|
| Influence of GLIS on decision making process in UU | - Speeds up the process  
- Faster way to have basic data  
- Makes the works much easier | - Time because one can access information directly  
- Information quality, as human beings always making some errors | - Time: things can be found in minutes instead of days  
- Quality: finds out things that were dreamed to get before GLIS | - Correct and up-to-date data | - Time friendly, as graphs explain things faster  
- Better data and decision quality  
- Less work complexity | - Tasks take less time, GLIS is perfect for time saving  
- Much better quality  
- Tasks are done easier | - Easier to spot errors and correct them  
- Cuts analysis time greatly |
| Other comments | - Very pleased with the system  
- GLIS is very effective  
- General satisfaction with GLIS  
- GLIS has crucial affectivity | - Very satisfied with GLIS  
- Is very efficient and effective | - Very impressed with the BI system  
- GLIS is an important tool | - Totally satisfied with GLIS  
- An effective tool in decision making | - Happy with the system  
- GLIS is very effective for some tasks and can be less effective in other tasks | - Good satisfaction with the system  
- Positive effects on decision making |

Table 4: The summary of the Analysis depending on empirical findings
After the summary of the analysis, we intend to make a framework below to show the impact of Business Intelligence (BI) on the decision making process (DMP) in academia. The reason to make this framework is to display our findings in a more general context. The framework shows an overview of a BI system, the uses and benefits of BI in academia, and most importantly the impact of BI on the DMP in academia with possible outcomes. For example, the BI system is used as an indicator for the university activities all the year round. The framework also shows how a decision making process works. In special cases, there can be no effect of BI system in decision making. But in general, it has large positive effects on the DMP. The top affected factors in this case are time, quality, and ease as shown in the figure below.

![Framework for the impact of Business Intelligence (BI) on the decision making process (DMP) in academia](image)

**Figure 22:** Framework for the impact of Business Intelligence (BI) on the decision making process (DMP) in academia

**Chapter summary:** After reading and understanding the empirical documents and the transcribed interviews, we have found many similarities and some contradictions that we filtered out to reach some final analysis points that concern answering our research questions.
6. Conclusions

This chapter concludes the whole analysis by answering our two research questions of this study.

Our analysis discovered a positive impact of the university BI system, GLIS, on the decision making process. Also it was clear both that GLIS is largely used in Uppsala University as a general information system, and some people use GLIS information as a base for making decisions in the university.

For the purpose of making a generalization, we asked two of the interviewees if there is any other university in Sweden that uses GLIS or any similar management system. Eriksson answered, “I know that we are helping the Linné University to set a similar solution as GLIS. Otherwise I know that almost every large university has a data warehouse solution. There is also a network of the ones who use ProDiver; among them are Umeå University, Mittuniversitetet, and Lund University notably.” Also Olsson replied, “As far as I know KTH, SLU, and Karolinska institutet use various other platforms (software) for the same purposes and Chalmers, Göteborgs universitet, and Stockholms universitetet are in the process of developing the corresponding solutions.”

Below we answer the two research questions that were asked in the beginning of this thesis based on the analysis part we have got.
Answers to the Research Questions

1. Why is it beneficial to adopt a BI system in a university?

The analysis part showed clearly that as a BI system, GLIS is highly beneficial to Uppsala University, and that is because of several factors. GLIS is used by people at different levels and for different tasks. As it is the general information system in the university, GLIS has many functionalities and different uses in Uppsala University. It is used as a data repository as it combines data from many other internal and external systems like Uppdok system, DiVA system, admission system, etc. It is used as a reports generator providing reports from many different kinds of data and from different databases. GLIS is also beneficial to be a historical data storage system as it saves large amounts of data digitally which can be used in future, and a follow up system for the university issues.

Many universities in Sweden are using GLIS or similar type of BI tools. We think that universities in Sweden are functioning in a closely similar context like Uppsala University as they almost have the same tasks and decision types, like students admission, publications, salaries, gender indications, premises, finance reports, etc and many other similarities.

BI systems are absolutely beneficial tools in universities as they simplify administrative works by making tasks easier. Also things take much less time by using the tools. Thus BI tools speed up the processes of different tasks. They are the only indicators to show how things really are at specific moment in universities. BI tools are favorable in providing data in secure ways because they combine and store data from different systems. Finally, the data and reports obtained from BI systems are used as the base for decision-making in universities.
2. How may the adoption of BI influence the decision making process in a university?

GLIS has a big positive impact on the decision making process in Uppsala University. GLIS does not influence the decision making process as it does not have the power and agenda to do that; rather it affects the decision making.

Based on our analysis and according to what we mentioned in the beginning of this chapter, we can conclude that a BI tool affects the decision making process with respect to three factors: Time, Quality, and Ease.
Time: BI tools speed up the whole decision making process in universities, while decreasing decision making time to a large extent.
Quality: BI tools affect the quality of the decisions made in universities. They help largely in making better quality decisions.
Ease: The decision making process becomes much easier with BI tools as the decision making activities take less effort in the form of collecting data, analyzing them, and making better quality reports. These reports are the base for making decisions for a university management and others.
The factors mentioned above are affected, because BI systems provide the responsible people access to a large amount of data from different databases, combines the data in different combinations when required, and presents them in reports or graphical forms. Along with availability, BI tools also ensure the validity and high quality of these data used for making decisions.

A BI system in a university, sometimes, has no effect on the decision making process in special cases. This is because some decisions are influenced by some external factors, for example Government rules, which will eliminate the power of the BI system on the decision making.

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**Chapter summary:** Here we have answered the two research questions based on our analysis. And we have found a large positive impact of the BI tool in a university on the decision making process.
7. Final Discussion

This chapter contains our reflection about the thesis, scientific and practitioners’ perspectives, and ethical considerations related to this research. In addition, this chapter suggests some possible improvements and includes recommended future work related to the thesis.

7.1 Reflections

Our work on this thesis including the research, the writing, and the analysis has been very interesting. We think that research on the business intelligence area has been very attractive and we have added some contributions to this field.

In this thesis we have followed the case study strategy and used a qualitative approach as the data collection method. We think that this strategy and this approach are very suitable as they drill down deeply in the information found in literature and through interviews. We have found good results after the analysis. Even though, other approaches could be used instead. These would generate different types of data and output, which would also be interesting to find out.

We have followed the techniques from grounded theory approach in our analysis because we found out from literature reviews that it was the most suitable approach in doing this type of research, i.e. qualitative case study.

Our empirical data were mainly collected from interviews, and secondly from documents. We conducted seven interviews until we reached our saturation point in getting new information. Also we believe that all our interviewees were well selected, as we followed the snowballing method in finding them which seems to be very desirable in contexts similar to that of this thesis. We have a limitation in this thesis that we did not go back to the interviewees for checking after transcribing the interview tapes. Again, other data collection strategies could be used, for example Questionnaires, and it would be of interest to see the final results.

The purpose of this thesis is to find the power of business intelligence on the decision making process in Uppsala University, and we conclude that GLIS is a beneficial
system in Uppsala University and that it has a big positive impact on the decision making process in the areas of time, quality and ease.

We cannot make a real generalization in this case study because we would need to analyze the power of some other BI systems in many other universities in Sweden. Therefore we can partially generalize our conclusion that BI systems have a large positive impact on decision making processes in academia in Sweden; and time, quality, and easiness are the top affected factors in decision making.

7.2 Scientific Perspective

There has not been too much research on the effect of BI on decision making process so far. Specially, we did not found large amount of works on uses of BI tools in academia. In that concern, this thesis adds something to the research field of this kind. In the scientific perspective, the thesis contributes with the extension of existing theory on BI uses in academic institutions. By saying academic institutions, we consider mostly here tertiary level institutions as there are large amount of data from different databases internally and externally. But, same thing is also applicable to other levels of educational institutions where there is a need of making quality decisions within less time from large amount of data for the institution management and others. Using a BI or an IS tool will make different tasks much easier in this type of situation.

7.3 Practitioners Perspective

This work can help IS practitioners in the sense that they can gain knowledge and insights about the power of IS tool in university management in Sweden. This thesis also shows the dominance of a Business Intelligence system on the decision making process in an educational institution. Similar kind of BI systems can have large positive impacts on decision making in business organizations too. Decision making is a big part of any organization. We can also say that BI tools affect decision making in different types of organizations, like banks, insurance companies, manufacturing companies, retail companies, hotels, hospitals, communication companies etc. by
ensuring that their decision making activities will take less time and provide better quality decisions in much easier ways.

7.4 Ethical Considerations

Research ethics are central in any research. Ethics are *norms for conduct* that distinguish between acceptable and unacceptable behavior (Resnik 2011). In this thesis, we have tried to follow ethical and social values to our best. The notable ethical issues that were covered in this thesis are honesty, objectivity, carefulness, respect for intellectual property, openness, respect for colleague, legality, competence, etc (based on Resnik 2011). We were honest in all communications with the interviewees. We tried our best to avoid bias in data collection, data analysis, data interpretation, and other aspects of research. We carefully examined our own work and all parts. From the very beginning, we kept good records of our all research activities, such as research path, diagrams, points to include later, changes in the plan, data collection, etc. We have made proper citations in our writing according to the original documents. Also we have included appropriate reference list of the literature used. In the appendices, we have included all the interview questions and the answers of all interviewees that we made for this thesis. We got proper permissions from the interviewees for recording their speech during face-to-face interviews and also for publishing it later in our thesis. We gave proper acknowledgements for all contributors to this thesis. We, as thesis partners, had mutual respect between us and we treated each other nicely. During the thesis work, we came to know and tried to obey relevant laws and institutional policies for our own good. Lastly, we tried to maintain and improve our own competence with time.

7.5 Possible improvements of GLIS

In general, it’s not uncommon for an IT system to have some points to be improved for a better functionality and more user involvement. After conducting the interviews and analyzing the data obtained, we found out that GLIS also has some points that could
be improved. Here, we mention some suggestions for GLIS that could make it better and more advanced.

Firstly, GLIS user interface is quite basic. As GLIS is a quite big and complex system, its interface design can be improved so that it becomes easier for users to find information and generate reports. Secondly, we found out some problems with the reports interface tool. The reports themselves are good but they need some enhancement within the text visibility and how things in the reports are displayed and structured. Therefore a better reports design is recommended, i.e. reports should be presented in a more user friendly and more effective way. Thirdly, GLIS displays information in the Swedish language only. Therefore an additional common language, i.e. English, is recommended to display the information; this is because GLIS is also being used by English speaking people. Fourthly, GLIS system needs to be tied up, because information about a certain thing in any GLIS subsystem could be different than in another GLIS subsystem. Therefore GLIS should check if all information about any certain object is similar in all subsystems. Finally, processing time in GLIS needs to be enhanced. As the system is becoming larger and more complex, it will take longer processing time; therefore GLIS system needs to match today’s technology, i.e. better hardware properties. Also GLIS is recommended to be accessed not on computers only, rather on iPads and mobile devices so that GLIS becomes more available and accessible.

7.6 Future Work

We have found out that there are very limited researches on BI uses in academia. This area needs to be further explored. We have here some suggestions for that. It would be interesting to see what specific functions get mostly benefited from the BI system in Uppsala University. Another investigation can be made on the sources of data integrated in GLIS. Another area for further research could be how to improve the user interface of GLIS. It would be very interesting to use another strategy to answer the research questions in this thesis, for instance to do the same research using the Survey strategy.
Similar research can be done on the BI systems in other universities to see the effects in particular cases. It would be interesting to investigate similarly the impact of BI in business organizations too. The final suggestion for further research is to carry out a quantitative data collection on a good number of Business Intelligence systems in different universities in order to fully understand if and how BI is affecting the decision making process in academia, and how the system could be improved for a better functionality. This research, being a qualitative case study, has a low level of generalization, but it offers significant insights that can give a foundation for further researches.

**Chapter summary:** In this chapter we have included our reflections, and the contribution of this thesis in scientific and practitioners’ perspectives. We have mentioned the notable ethical issues that were covered in the research. Some possible improvements for the current GLIS system have been suggested that could make it better and more advanced. Finally, we have included some suggestions for future studies.
References


Appendices

A. Interview Questions:

- Respondent

1. Can you tell us something about yourself? (name, job position, tasks, background, etc.)

- Use of GLIS

2. Can you tell us about the Use of GLIS?

3. For about how many years have you used it?

4. How frequently do you use it?

5. In what way it is beneficial to adopt a BI system, GLIS, in Uppsala University?

6. For which purpose do you use GLIS? (like Students admission, Education (Basic/Advance level), Education (PhD), Publication reports, Staff reports, Economy/Finance reports, University premises, Gender Indicators of Uppsala University, etc)

7. How may the adoption of GLIS influence the decision making process in Uppsala University? Which factors (like time, hardness, quality, etc.) are affected in what ways?

8. What are the decision making activities in decision making process?

9. What has GLIS historically been used for? From when decision making process has been a service/target of GLIS?

10. Who are the users of GLIS? Do all or some of them use it for decision making activities?

11. Do you recommend us any document to read related with GLIS?

12. Do you have any other comments?
• Evaluation

13. Who implemented GLIS and who is responsible for the maintenance of it?

14. To what degree does GLIS fulfill your expectations? What is about the cons with it?

15. What are your future needs for GLIS?

• Next person

16. Who are the next person(s) you recommend us to interview that helps us in this research?
B. Answers to the Interview Questions

Respondent 1

- Respondent

1. Can you tell us something about yourself? (name, job position, tasks, background, etc.)

A: Leif Eriksson. I have been working at the University for around last 25 years. I started at the University Library. And I have been working here, Planning division of the University, since 1996. For a number of years, I had divided my work, half time here and half time in the Library. I have been working for mainly the Publication system, the DiVA system, implementing the DiVA system, trying to get all the researchers to put in their publications in the DiVA. For the last five years, I have been working as an Analyst at the University administration and responsible for analyzing research through publications, and also University rankings. That’s mainly the background.

- Use of GLIS

2. Can you tell us about the Use of GLIS?

A: GLIS is used to follow up and analyze all activities within the University. For me, I work with the publications, the development of the publications, and the output. Others are most interested in developing divisional stuffs, for example Gender, how many women are working in certain positions, the age structure, also the sick leave, of course the economy system, the budgets, and also the students situations, how many students there are, how well are the students doing with their courses, how many are getting the exams in time, how is the dropout rate, and so on. The every such aspect generally in the University is done with GLIS.

3. For about how many years have you used it?
A: GLIS has been developed in last few years, but I think it has been started around 10 years before, in around 2001-2002. It’s difficult to say exactly when the system started like that, because it’s a continuous developing process. I am using it for approximately last five years. The development came with the ProDiver, the analyzing tool, which was interesting and kind of boost, because you can do calculations and get figures, and you can draw better systematic conclusions from the materials. At least for me, the ProDiver was a big improvement in the system.

4. How frequently do you use it?

A: Not daily. It depends on the nature how the work is organized. For example, when we are using Publications output in our funding model for research, when I am calculating that, I am using GLIS all the time which is my main tool to do that. But, that may be one month per year I am doing it every day. Then for maybe a couple of months I am not doing it. I am using GLIS intensively for certain periods. Then I am not using it. So, it’s little difficult to say. In total, may be three months per year I am using it very frequently.

5. In what way it is beneficial to adopt a BI system, GLIS, in Uppsala University?

A: Well, of course you can do all the things that GLIS can do. But, it takes much longer time. And the main advantage with GLIS is that you can combine data from different systems, for example, from personal system, from the student system Uppdok, from the economic system, the diva system, and so on. For instance, if you want, you can combine publications per age group, publications per professor compared to doctoral students, and so on. You can do almost anything with GLIS. That’s I think the most important contribution from GLIS.

6. For which purpose do you use GLIS? (like Students admission, Education (Basic/Advance level), Education (PhD), Publication reports, Staff reports,
A: I think, everyone from these can be applied with GLIS. But I mostly use Reports. But it also has to do with the Finance. The publication is connected with the finance, because we use it in our allocation models. Of course you can analyze publication data to see the trends, for instance, you are publishing more in international journals than before, and so on. For me, publication reports are the main things. I am also responsible to send some data to ranking institutions, like Times Higher Education ranking. They ask almost about everything. Short answer is mainly publication reports.

7. How may the adoption of GLIS influence the decision making process in Uppsala university? Which factors (like time, hardness, quality, etc.) are affected in what ways?

A: I would say, it’s just a base. The basic figures are calculated more in a more stable way in GLIS. This is the main contribution. You can validate data in much more secure ways. Of course, you can do that from other systems. It’s easier to have these basic data ready. It speeds up the process in many ways. We are using GLIS when we are making the budget and also for the Planning, like we do right now, the process of planning for the next year 2014 and we are calculating in GLIS very much. How the funding is going to be divided within the University for the next year. So, I say it gives a faster way to have basic data, also a secure way it is.

(Q: What about the quality of the data?)

I would say, the people who make decision may not look at GLIS, but it’s our job to supply the data. So, they don’t control the data in that way. They only see the reports. They are confident that the reports are alright. In that way, it may be a better quality. But, I wouldn’t say that it influences the process of decision making. That’s little too much to say. But, it makes the work for us much easier, because we have to supply data for the management of the University. GLIS just generates reports. But with Diver, you can also generate your own reports. At least people from this department work with their self-generated reports. We don’t generally do the reports that you see
in the web, the fixed reports. That’s mainly for the decision makers so that they can see the trends and so on. But when you pull out data, for instance, when you want to have a report for the next budget, you can do it from GLIS. This is what I work with, the publication part. So, I divide within the main scientific domain with how much they have generated. So, I calculate it in GLIS. Then I transfer it to a form like this and show it to the responsible persons. They make decisions looking at these. They can’t argue with the figures. The figures are alright. So, GLIS make the decision base. So, of course you can do it in other ways. So, I would not say that GLIS is a must to do this process, but it speed up the things. It’s much easier to work with GLIS, faster as well.

I would say, the question is little bit wrong. Because it doesn’t have any influence on the decision making process. It has much to do with how you collect the basic data, to present it for the decision makers. So, you can’t really influence the decision making with GLIS, it’s just a tool to collect and supply the good basic data for the management. The question sounds like the management are dependent on GLIS to make decisions but it’s not like that. It’s just like a tool for us for working with figures to supply data. It’s a good tool. So, I would not say that a tool has influences. Rather it helps.

8. What are the decision making activities in decision making process?

A: For me, it’s just for collecting data. I would not say more than that. It just supplies data, because I am not making any decision on it.

9. What has GLIS historically been used for? From when decision making process has been a service/target of GLIS?

A: Omitted.

10. Who are the users of GLIS? Do all or some of them use it for decision making activities?
A: Omitted.
11. Do you recommend us any document to read related with GLIS?

A: These two documents will be helpful for you I hope. One is a published paper on GLIS and the other one is a PowerPoint presentation of GLIS to some audiences. I think, there is something more written about it. I can check. Actually, two persons were working with GLIS. One is retired and another is on a child leave currently. So, they are not here. I have their email addresses. You can contact them if you want. I think, these might be the right persons to have some more documents as they have developed GLIS from the very beginning. What I have, just I have given them to you. And, I am afraid there is not too much written about the system in them. I don’t have any more things currently.

12. Do you have any other comments?

A: Well, in general, I am very pleased with the system. For me, it has been a great help. And we are constantly doing the development with GLIS. We are trying to do new models, trying to make get in new data. I think, it works for any aspects of GLIS. I think, it has a potential of being even more used. The thing is that you may have to work with it frequently to see the potential of the system that might be a little setback for the system. As I told you before, the decision makers have seldom times to get into the system; they rely on the reports that are generated with the system. That might be another drawback, but that is very common I think for any other Business Intelligence system. If you want to use its full potential, you have to spend a lot of time and the decision makers don’t have that much time. It’s not only for us; I think it’s a general problem for all other systems. So, you have to have specialists that are good to collect data from the system and to send them to the decision makers.

- Evaluation

13. Who implemented GLIS and who is responsible for the maintenance of it?
A: It’s the unit that I am working in now, the Planning division, we are responsible for that. For the operation, the IT department in Polacksbacken is responsible. But the development and the maintenance are performed here, in Planning division. So, we have models for every data systems. It’s called pm3 model. I don’t know, you are familiar with it or not. Every data system in the University is connected. So, it has one person who is fully responsible for it, who is the chief of this Planning unit. Other two persons are below that person who also has some responsibilities. And there are also reference groups to the systems with people from any aspects, for instance, from economy, from students’ bureau, from personal system, and so on. So, the reference groups see that the new things come in the systems, the improvement with the systems, etc.

14. To what degree does GLIS fulfill your expectations? What is about the cons with it?
A: Yeah, it’s perfect for me.

(Q: Is there any disadvantage with it, do you think?)
I don’t think of any really, because, we can use it for more data. You can take more data from other sources that are not from University system also, for instance, we are also interested in citations from Publications. But those are not available in DiVA or University system, so they come from Web of Science, or similar. There is possibility to take these types of data into GLIS also. We have not done that, because it’s tricky. You have to update data at all time, because citations are things that they change every day. So, I can’t really see any limit. But, maybe I am little influenced because I have not used any other such kind of system yet. I don’t know really whether it is the best system or not.

15. What are your future needs for GLIS?
A: The interface, I mean, the reports look can be improved so that it should be easier to understand the report for persons those who are outsider. It does not have anything to do with the reports, they are fine. You can do little improvement with the texts in the reports. I think, we have to improve some arrangements in the reports. In the system, I think, you can develop it if you want. But, right now, I am happy with the system.
16. Who are the next person(s) you recommend us to interview that helps us in this research?
A: It depends on what you want to do. The best thing is to interview someone from the management. But I am not sure, because they have limited time. (We will send emails to asking their permissions.) I can write down two names. First one is from our unit, the one who is in-charge of the unit: Joakim Löfkvist. And the other one is Anders Malmberg, deputy vice-chancellor at University Management and Management Council, UU.

(Q: Can you please give us a little more explanation of the answer of Question 7?)
GLIS helps in decision making, but does not influence on it. There is a difference between ‘helpful’ and ‘influential’. ‘Influence’ is somehow little bit related with ‘change’. If something influences you, you make decision based on that something or someone’s opinion. This is my opinion that you should make decision on what you think. GLIS has just data based on which decisions are made, but it does not influence on decision making process. Rather it ‘affects’ on the process. Influence is also related to ‘modify’ someone’s opinion. GLIS data are only figures that are neutral. They don’t have influences. Well, you can say ‘influence’, but in a different way.
GLIS helps or affects decision making. It’s a tool that provides us data much faster and the data are more reliable.

Maybe someone else can give you a different answer. It is my interpretation. I am not saying, the question is wrong, but for me, it’s a little hard for me to say that GLIS has influences. But you can ask someone in the decision making positions, may be they can say the exact thing. So, still you can keep the question. It’s not wrong. Buy my position point of view; I don’t think that it influence people. It just presents figures, calculates figures.

(Q: Do you think that some other universities are using GLIS or any similar kind of tool for university management? Can you give us some examples regarding this?)
I know that we are helping the Linné University to set a similar solution as GLIS. Otherwise I know that almost every larger university has a data warehouse solution.
There is also a network of the ones who uses ProDiver; among them are Umeå University, Mittuniversitet and Lund University notably.

**Respondent 2**

- Respondent

1. Can you tell us something about yourself? (name, job position, tasks, background, etc.)

   *A:* Joakim Löfkvist, I work at university administration, my job position is controller within economy, accounting IT and all that combined, I also work with the planning for the whole university it means budgeting and all that. I have not been here for a long; I have one year experience in Uppsala University.

- Use of GLIS

2. Can you tell us about the Use of GLIS?

   *A:* It is sort of, we combine facts and figures from different systems into one and you can make sort of ground for decision making. It is a general system that combines facts and figures from different kind systems you do not need to go to them separately you can also make nice looking reports and stuff like that it important to have easy to understand.

3. For about how many years have you used it?

   *A:* I have been using it for the whole year.

4. How frequently do you use it?

   *A:* I use it every day, i.e. many times per day.
5. In what way it is beneficial to adopt a BI system, GLIS, in Uppsala University?

A: It gives a possibility to make better decisions in a way because it give access to facts and figures in a better way than directly from different systems, you can also use it in sort of combine facts to make new figures and divide in different kind key numbers what you need to know that is why it is beneficial in a way also that you do not need to ask people to give you facts and figures you can sort of get it from the system you do not have to make it manually to make people send it to you using excel or whatever, you can access the system to get it directly.

(Q: If we make a scale: highly beneficial or medium or less?)
It is highly, it is crucial I would say.

6. For which purpose do you use GLIS? (like Students admission, Education (Basic/Advance level), Education (PhD), Publication reports, Staff reports, Economy/Finance reports, University premises, Gender Indicators of Uppsala university, etc)

A: In my role I use it for everything I would say, everything that is in it from accounting, to economy and financial reports to whatever because we make the annual reports and in the annual report you have all these.

(Q: is GLIS mainly for annual reports?)
No, for me it is, it is for the whole university for different kind of stuff.

7. How may the adoption of GLIS influence the decision making process in Uppsala university? Which factors (like time, hardness, quality, etc.) are affected in what ways?

A: Visually it is Time, because you can access information directly and you do not have to ask someone to make summary and sent or mail it to you, you can just access
it directly so when we for exam make annual reports we do not ask people to send in any facts and figures or numbers to us we just take all these from GLIS system, the BI system, what I can do is that I can just check the...(some boxes) , the all numbers are correct, they just keep the quality up and we just pick it up from the system, so we do not have to ask them. So it is much faster that is why you can make annual report in couple of weeks instead of. with few people making something in couple of weeks and also we can have sort of that is why we can take decisions and make decisions quite fast, we do not have to wait until okay take me two weeks to put this together, instead pick it from the system.

(Q: any other factors affected also rather than time, think the system is not implemented?)
I mean everything, quality as well, in decision making and also quality in numbers, if you have human beings sitting there they are always making some errors, information quality.

(Q: Does so GLIS have a good influence on decision making?)
Oh yes, It has.

(Q: Scale for decision making?)
It is highly influential, eight or nine or even ten out of ten it is crucial in every...we can also, it is possible to take GLIS away, we can always find all these by searching in different databases and stuff like that manually but in a way you are making GLIS in a manual way, it takes time and you make errors, so if you have this type of system for us I mean it is crucial, otherwise Leif, you will need three Leif to be there, I need to be four five people. We can be more effective, we can be faster you can take decisions you can always set it up in a way you can know what type of decision make, because you always have facts and figures with you, you always know what... the effect on decision is not possible to see, I can take this to vice chancellor and she can make decision directly. I can also make decisions in my areas.

8. What are the decision making activities in decision making process?
A: Everything we suggested in the previous questions. Whenever you have a system that we have it in GLIS, GLIS has many internal data, as well as external data as you can compare benchmark data with Lund university for example in upper level, it could be used for many decision making activities.

9. What has GLIS historically been used for? From when decision making process has been a service/target of GLIS?

A: If I understand it correctly, it is a general system that what stands for G, it is a neutral or general system; they used it mainly as a report system, easy way to get reports.

(Q: Is the primary goal implementation is for reports or for decisions?)
Actually the primary goal was to make decisions, but they used it for reports, because the L stands for Leadership, general leadership information system. But they did not use like that because they built reports within it, maybe they thought if we have reports we take decisions from reports but I away in last couple of years they are using it by combining data to make package that you use the package you need for making a decision, not just you can pick these reports and you make any decision you like. GLIS have indicators, like gender indicators, green are good, red are bad, but it does not state that you have to make decision. It makes you think of making a decision, it is sort of guideline, it helps you. GLIS is intelligent in a way.

10. Who are the users of GLIS? Do all or some of them use it for decision making activities?

A: I cannot really say. There are different type of users, A couple thousands users, I am not sure of the numbers, maybe 20 to 30 percentage are decision makers some others are giving input, others are maintenance, and so on.

11. Do you recommend us any document to read related with GLIS?
A: I am not sure we have it, No recommended documents, since there is little documentation about the system as we were talking with Leif Eriksson.

12. Do you have any other comments?

A: What we are going to do with GLIS, first we have to tightened up little bit, from beginning it has because it has evolved within itself without really sort of through a real plan. and we are going to add all tools for analyzing data to make it even better because we want people who are working in the system to help them to make analysis and better decision and also It should be available to be used in luxury phones, IPads and others because the university is moving from papers to digital, GLIS has to be there also. GLIS does not have any analysis tool in it, they have external tools. ProDiver is an application to input and output from GLIS.

- Evaluation

13. Who implemented GLIS and who is responsible for the maintenance of it?

A: it was implemented within this department, by the department of planning, and we are also responsible for the system as whole, the technical part we buy from the IT department. But we are responsible for GLIS.

14. To what degree does GLIS fulfill your expectations? What is about the cons with it?

A: It does not totally fulfill my expectations, it was evolved by itself, not structured, you do not know where what is, and it needs to tighten up. And to make it easier to maintain as to get better reports like one report instead of ten slightly different reports to express something. That might affect the decision making as different people has different access level to the system this is one, and in a way if you make a report in title you want; you might take better decision.
I do not know really, a disadvantage is that we trust GLIS; instead GLIS should make sure that information is the same in different sub-systems. For example, differentiations between finance and staff systems that GLIS does not check.

15. What are your future needs for GLIS?

A: Make it more available (digital), checking subsystems, access the data directly without having many middle subsystems (scan a document, send by email, convert to excel). These will hopefully affect the decision making process to be faster and more quality.

- Next person

16. Who are the next person(s) you recommend us to interview that helps us in this research?

A: Mainly: Krister Ågren and Mats Olsson. Secondly: Anna Wennergrund, she moved to Carolina library, she worked a lot with finance, facts and figures, and now she is using GLIS after moving to the library.

(Q: If GLIS is down for some days can the university survive?)
The university can survive for max a week in case GLIS is down, but they still able to go back to the subsystems to get info but that is time consuming and more work.

Respondent 3

- Respondent

1. Can you tell us something about yourself? (name, job position, tasks, background, etc.)
A: Mats Olsson, I used to be a teacher, by educational and biology with a lot of interest in statistics, I was a lecturer at the university until 2003 I think, and I had courses in statistics, then there was a position available in the administration which I moved to, and it was mainly because of my interest in statistics and my competence in it, the job position called analyst.

- Use of GLIS

2. Can you tell us about the Use of GLIS?

A: it was one on my main tasks when I started at the administration, then it has being running for maybe 3 to 4 years. And regarding the use of GLIS, it is an interesting question, what make it difficult to answer it because it can be used in so many different levels and supporting different interests, many people have many things to pick there from the system, from the beginning the people who started to appreciate it very much was at the faculty administration because from the beginning GLIS was supposed to support the annual reporting but then it developed and very soon the faculty administration realized that GLIS was useful for them, then there might be a bit approving and supporting and development on that, but then there was many different things, since few years, it became important for economy administrations, it turned out to be the only place where they could pick the budget or planning numbers together with results from the economy system, then there is something, they are working on just now, in the university like most enterprises, there are internet buying and selling and that is regulated directly in the economic system, but at institutional level they need to have the verification and specification of what they bought and costs, but certainly GLIS is very useful for calculating the university premises costs, in the beginning, before they started using GLIS they had to send a lot of letters many times a year as there are hundreds of institutions so there were a lot of work, but now we do not need to do anything, before GLIS they have to work with excel to get one thing for one institution and another excel for another institution, that was mess. Now they are working on the same thing, on telephone costs, IT equipments are already on that way, the printing costs are decreased, and a lot of that things, when it comes to
user, the most frequent use is on personal data I am pretty sure that people want to look for salary, but maybe a way for many people is to discover the system.

3. For about how many years have you used it?

A: Well, I also used it, but mainly I also designed it, there was already one version when I started 2003, but in 2005, we changed to another software. So I worked on its design which was different design. I think that was a very good thing because at the same time I was a user and creator or designer, so it made it more easy to me to design it because I had very good ideas about what could be good and how could be used, because as analyst I worked very much with annual reporting and planning processes that where you need the figures, that was the thing we started with in GLIS, that was about the students, human resources and economy.

(Q: who programmed GLIS?)

I did it, because it is very user friendly software, as you do not need to have particular skills to develop the system, GLIS does not need any programming, as it is drag and drop software.

4. How frequently do you use it?

A: Already answered the question. As an administrator I take care of GLIS every day.

5. In what way it is beneficial to adopt a BI system, GLIS, in Uppsala University?

A: It is quite simple, it is absolutely necessary; you could not manage without something like it. Every similar organization has something but may be simpler or more primitive but they have something to put the data together. So far you have such big data in databases one database for student and resources, registrations and human resources, salaries and other complicated systems data and premises data. All these databases are so complicated; there is no person that can manage all these data.
6. For which purpose do you use GLIS? (like Students admission, Education (Basic/Advance level), Education (PhD), Publication reports, Staff reports, Economy/Finance reports, University premises, Gender Indicators of Uppsala university, etc)

A: All of them.

7. How may the adoption of GLIS influence the decision making process in Uppsala university? Which factors (like time, hardness, quality, etc.) are affected in what ways?

A: Certainly time and quality. I think it is evident, you put the factors, time and quality; are evident, they are affected, during the development of GLIS we had evaluations, the particular facility administration said with GLIS I can find many thing in 5 minutes which took me several days before and also now with GLIS you can find out things that you dreamed for before, so time and quality are evident. (Q: but how do GLIS influence the decision making process, does it collect data from different databases and combine it in reports and graphs, then you make decisions according to these reports) yes exactly, for example the admission process described in that paper (Decision support for the academia at Uppsala University) that is one certain thing you must not admit too many students or you must not admit few students sometimes it is important to get more students. Without GLIS you have to pick the data manually from databases as they receive data only, also GLIS combine data from different databases. (Q: Does GLIS have influence on decision making or planning?) It has influence on both, they are the same thing actually, planning is decision making.

(Q: Do you think GLIS “influence” or “affect” the decision making process?)

(After checking the words meaning in online dictionary) Yes it might be correct, and then it should be affect decision making process instead of influence because GLIS of course has no agenda to influence the decision making.

8. What are the decision making activities in decision making process?
A: Again you have to ask someone who makes the decisions. But obviously one important thing at least it should be important for decision making that you collect necessary information, I think this is the only thing GLIS can stand for.

9. What has GLIS historically been used for? From when decision making process has been a service/target of GLIS?
A: It is already answered.

10. Who are the users of GLIS? Do all or some of them use it for decision making activities?

A: That is also what we started more or less. But certainly all users of GLIS do not use it for decision making as I told you about billing record, many things is just information sharing. GLIS users number is very unclear number because some people just use it every day, someone per week, others once per year also you can use it in different levels. I think there are around 200 registered users who log in to GLIS.

11. Do you recommend us any document to read related with GLIS?
A: I do not have any particular document related with GLIS.

12. Do you have any other comments?

A: What could be interesting is this kind of system in general is developing together with IT development these days, so the software you use get new version every year and it getting better and better so when we started 2005 that was the beginning the similar system did not exist at that time and since that it was developing so I think it is very interesting and it happens a lot, it is very integrated with IT development.

- Evaluation

13. Who implemented GLIS and who is responsible for the maintenance of it?
A: I made the development on the new platform, I designed the application.

(Q: you designed the system, but who programmed the system, for ex. the Interface?)

There is no programming, because you need IT competence for installation of the system, you need to get the system installed, firewalls, and there are specific programs depending on how you retrieve your data, and there are certain models need to be installed which is installed by IT department. There are many companies like SASs those kind of very complicated systems need programming competence.

14. To what degree does GLIS fulfill your expectations? What is about the cons with it?

A: I am amazed; I think it is very good. GLIS is one thing, and the software Diver solution is another thing, Diver solution I think is very user friendly. A problem with GLIS is that the information is growing on and it needs more time and better computers to combine more data at same time. (Q: what do you think about the Interface?) I think it is a very good frame.

(Q: Can you tell us (one) Problem with GLIS and your suggested Solution to that problem?)

It is already talked, processing time.

15. What are your future needs for GLIS?
A: You can always improve, but there are always cons and pros of improvement.

- Next person

16. Who are the next person(s) you recommend us to interview that helps us in this research?

A: Ewa Hjertsen, she is a GLIS user, not like me and Krister. Then from ITC you have Michael Petrén he is technical guy, he works 5% of the time on GLIS, and Björn Wiberg who is the student of Michael.
(Q: in the beginning was GLIS implemented for decision making or for annual reports?)
Well, we already mentioned that before, it was used for annual process, but I then annual reports are used in decision making.

(Q: Is GLIS a BI system, DSS system or Management intelligent system?)
It is all of them, I wrote Management Intelligent system instead of Business Intelligent system because GLIS is not used as a profit and business system, GLIS is more for the university management and not like other commercial companies who calls it BI system as it is used for business and profit. So MI is better word that BI as the university does not use it for money rather than management.

(Q: Do you think that some other universities are using GLIS or any similar kind of tool for university management? Can you give us some examples regarding this?)
Most universities are using something similar. There are at least 7 universities that use the same platform (= software = "The Diver Solution") as Uppsala University. Those are Umeå universitet, Mittuniversitetet, Karlstads universitet, Linneuniversitetet, Lunds universitet, Malmö högskola, Högskolan Dalarna.
As far as I know KTH, SLU and Karolinska institutet use various other platforms (software) for the same purposes and Chalmers, Göteborgs universitet and Stockholms universitetet are in the process of developing the corresponding solutions.

Respondent 4

A: My name is Björn Wiberg and I'm working as a Technical system administrator at the IT Division, Office for operations, at Uppsala University.
My main job tasks involve operations of Linux/UNIX machines used for many of the central, web-based systems at the university.
At an academic level, I have a Master’s degree in Computer Science, of which I use some parts (programming, scripting and similar) in my day-to-day job as need arises.

- Use of GLIS

2. Can you tell us about the Use of GLIS?
A: Not answered.

3. For about how many years have you used it?

A: I have been involved in the operation of GLIS since 2004-2005, at which time GLIS was running on a different software platform (SAS instead of The Diver Solution).

4. How frequently do you use it?

A: I usually act on error reports and inquiries from our monitoring (Operation Centre), the GLIS application support, staff from the Planning Division and, on occasion, end-users.

I consider the system to be stable in operations. Actions related to errors are required approximately 2-3 times a month. Actions related to inquiries such as account creation etc. are required approximately 4-5 times a week.

5. In what way it is beneficial to adopt a BI system, GLIS, in Uppsala University?

A: It aids in gaining understanding of where the numbers come from, as it offers the ability to dive (drill down) into the data.
6. For which purpose do you use GLIS? (like Students admission, Education (Basic/Advance level), Education (PhD), Publication reports, Staff reports, Economy/Finance reports, University premises, Gender Indicators of Uppsala university, etc)

A: Not answered.

7. How may the adoption of GLIS influence the decision making process in Uppsala university? Which factors (like time, hardness, quality, etc.) are affected in what ways?

A: As GLIS is (among other things) used for annual reports, it affects the economic aspects of the university in many ways. Hence, it is of great importance that the data contained in GLIS is correct and up-to-date.

8. What are the decision making activities in decision making process?
A: Unknown.

9. What has GLIS historically been used for? From when decision making process has been a service/target of GLIS?

A: As far as I know, it has been used (at least partially) as input for budgeting for many years now.

10. Who are the users of GLIS? Do all or some of them use it for decision making activities?

A: Study counselors, controllers (economy), heads of departments, and similar.
Not all of them use it for decision making, I believe, but it does provide all of them with information related to the activities at their respective workplace.
11. Do you recommend us any document to read related with GLIS?

A: Here are a couple of information pages about the product being used (The Diver Solution from Dimensional Insight, Inc.):
http://www.infotool.se/beslutsstod/the-diver-solution

However, I believe that Krister Ågren (Krister.Agren@uadm.uu.se) at the Planning Division has a set of presentation slides of GLIS.

12. Do you have any other comments?
A: No other comment.

- Evaluation

13. Who implemented GLIS and who is responsible for the maintenance of it?
A: Mats Olsson has done the major part of GLIS development.

14. To what degree does GLIS fulfill your expectations? What is about the cons with it?
A: My impress.

(Q: Can you tell us (one) Problem with GLIS and your suggested Solution to that problem?)
Not answered.

15. What are your future needs for GLIS?
A: Not answered.

- Next person

16. Who are the next person(s) you recommend us to interview that helps us in this research?
A: Omitted.
**Respondent 5**

- Respondent

1. Can you tell us something about yourself? (name, job position, tasks, background, etc.)

   *A:* Michael Petrén, job position: Consulting GLIS, my role is maintenance managers on the IT side we have maintenance model within the university separation with the activity and IT side. As well as the IT manager, I have been involved in GLIS by providing data to it. I have been working in the IT department for the last 15 years. And my angel to GLIS is somewhat different from the ordinary business intelligence as I try to use it in administrative tasks to simplify our processes.

- Use of GLIS

2. Can you tell us about the Use of GLIS?

   *A:* I cannot. I can, I have some idea, but the right part to answer that is the planning division in planning department. They are the actual users or the purchasers/clients of system owner.

3. For about how many years have you used it?

   *A:* for my specific use within the administrative work, since 2008.

   *(Q: Have you used it before?)*

   As an end user.

   *(Q: When you started using it as end user?)*
Basically from the start, every employ in the university use it to check salaries, as I use it to compare my salary with my neighbors.

4. How frequently do you use it?

A: I am providing data into the system. I provide data to it two times per year. And then these data are used by others. We are thinking to make it monthly

(Q: what type of data?)

I have different angle, for example the IT purchase, IT services and invoicing for all faculties and premises, so that happens each six months using GLIS. Before we had to use punch of papers, now we publish it in GLIS, so we can download it or have it in excel. It saves a lot of time. This is not a decision making or business intelligence it is purely administrative it simplify the administrative within the university. For example, we are responsible for the teleservice of the university. This person called for a certain amount of money. For example here is a mobile calls, it is nasty you can see all details about mobile calls; you can see here that guy here called international for 10000 sek in one month so it will be better for him to use Skype. You can see and make decisions according to it. GLIS is quite simple and easy to use.

5. In what way it is beneficial to adopt a BI system, GLIS, in Uppsala University?

A: I cannot answer for the normal business intelligence and decision making in high level, the planning department are the experts in answering that. But what I can see here in my own experience is that it tries to simplify administration process which is not standard way in business intelligence, it helps people in boring daily tasks into looking papers and dividing tasks.

(Q: It is moving from paper to digital?)

Exactly, it makes it easier and save time. But this is a small part of business intelligence in GLIS the big part is the planning department which is not my part.
6. For which purpose do you use GLIS? (like Students admission, Education (Basic/Advance level), Education (PhD), Publication reports, Staff reports, Economy/Finance reports, University premises, Gender Indicators of Uppsala university, etc)

A: It is already answered. I am looking at the administrative process.

7. How may the adoption of GLIS influence the decision making process in Uppsala university? Which factors (like time, hardness, quality, etc.) are affected in what ways?

A: I cannot say, it is the part of the planning department, they should answer that. I could say it should influence but I cannot say to what extent. (Q: which factors you think are affected?) I think both time and quality; I can take small diagram here from telephone calls. I got a picture, green is mobile data, red is services, and the other one is landline, you can clearly see that mobile rangey, that information should affect some kind of decisions how do we do our pre-recruitment, how should we have our information in our system do we need to have our data available in mobiles.

(Q: Think there is no GLIS what will happen?)
I think it would be much more difficult to make decision because you do not have access to combine and collect data from their resources, that will be more complex, time consuming and you probably not make right decisions.

(Q: But you still are able to get that on papers?)
Yes, but you will need punch of papers, and combination melting down data from resources.

(Q: Some experts say that GLIS does not influence the decision making process really, rather it affects the decision making process.)
I think it affects but it should influence. But again cannot say the usage because it the planning department task.

8. What are the decision making activities in decision making process?

A: I cannot say that, I am providing data and try to use it for my purpose, for example charging others, as I am not a decision maker.

9. What has GLIS historically been used for? From when decision making process has been a service/target of GLIS?

A: I think it is decision making, but again if you want to follow up on the department economy you can check it up, for example follow up for economy, publication, etc.

10. Who are the users of GLIS? Do all or some of them use it for decision making activities?

A: I am sure it is used centrally on the aggregate level on department of planning, but it is also it is used by prefix within departments, but also down to the data that I provide down to economy administrators in departments. Basically all levels are using GLIS.

11. Do you recommend us any document to read related with GLIS?

A: I have some manuals of the system, but they are not available. But you should talk to Krister.

12. Do you have any other comments?
A: I would say that there are some natural networks, I have a slight feeling that there is a need for good strategy, you need good aim and vision and strategy on usage for this kind of system. That is not only for Uppsala university only but it is common phenomena, we need to have BI system we must have because everybody else have that, but how to use it what is our vision what is the goal what is the strategy to implement that, I think that is something.

GLIS It is not fully implemented really, it is implemented to some extent quite big, but you still have to go to other systems to get data from that system. So there is no single point of contact to get data about university. Also the ownership of GLIS data, it is not clear who is the owner and who is responsible for them, for example I input data into GLIS regarding other departments, but we do not know to whom the data belong.

- Evaluation

13. Who implemented GLIS and who is responsible for the maintenance of it?

A: It was implemented by the department of planning, basically it is Mats Olsson. Ownership is by the planning department. Maintenance from IT side we are responsible for maintenance of content. But the actual maintenance that is the planning department.

14. To what degree does GLIS fulfill your expectations? What is about the cons with it?

A: From my point of view the data that I am working with it works very well, as I showed you. There might be technical aspects to it, like processing time and other technical stuff. It fulfils my expectation 9 out of 10.

(Q: Can you tell us (one) Problem with GLIS and your suggested Solution to that problem?)

A: In technical perspective, it is not linked in proper way to our authentication system. so it does not have single sign of function, you have your rights of access to GLIS then
you changed to another department, you don't get permissions automatically, instead you have to talk to people so they change that for you, very technical thing.

15. What are your future needs for GLIS?

A: To sort out the administration things that I talked about, telephone costs have to be finalized, print costs in Korint system have to go to GLIS, and others similar stuff.

   - Next person

16. Who are the next person(s) you recommend us to interview that helps us in this research?
A: Omitted.

**Respondent 6**

   - Respondent

1. Can you tell us something about yourself? (name, job position, tasks, background, etc.)

A: I am Anna Hagborg; I am the faculty directory of study. My main task is to lead the planning and organization of higher educational research in administrative level not scientific. My background, I have PHD in ethnology, I worked university teacher for 7 years before I decided to change direction.

Ewa Holmqvist, I am faculty administrator, I have worked with GLIS for many years, I secretary for the faculty. I worked for many years before that I studied economy, I worked at Uppsala Kommun.

   - Use of GLIS
2. Can you tell us about the Use of GLIS?

A: For planning and making prognosis. I think you also use GLIS for making follow ups. I would say finally it is an economic tool using to look at how many students do we have just now and how many we have planned to have because we get money depending how many student we have.

(Q: You said we use GLIS for planning, what is planning, is it decision making?)
Yes, it is one of important tools in the decision making process I would say. For example just now we are deciding how many students can we admit for next semester, and then we use GLIS for that.

3. For about how many years have you used it?

A: At least 10 years, since it was implemented. But we do not use everything because there are many things.

4. How frequently do you use it?
   A: I used it once per week.

5. In what way it is beneficial to adopt a BI system, GLIS, in Uppsala University?
   A: It is answered in next questions.

6. For which purpose do you use GLIS? (like Students admission, Education (Basic/Advance level), Education (PhD), Publication reports, Staff reports, Economy/Finance reports, University premises, Gender Indicators of Uppsala university, etc)
7. How may the adoption of GLIS influence the decision making process in Uppsala university? Which factors (like time, hardness, quality, etc.) are affected in what ways?

A: I think it very influential, especially when it comes to student admission. GLIS is our only indicator of how things really are at specific moment. Before we had to make it by hand, it was not easy and it took a lot of time, it was perfect for time I like it very much. (Q: any other factors are affected by GLIS?) Much better quality, easy to use.

(Q: Some experts say that GLIS does not influence the decision making process really, rather it affects the decision making process.)

I think it is probably more accurate to say affect, because it is not the only base for decision making there also other factors that we have to think about, when it comes to student admissions in a teacher education program we have for example: the government have told us that we have to admit a specific number of teacher education students for the preschool teacher education program in that case it does not matter what GLIS does. GLIS try to make the decisions better.

(Q: Can we make scale of GLIS affectivity?)

When it comes to the total number of students that we can admit to our programs then I would say that GLIS is very effective, when it comes to how to divide those student on different subjects or different programs then it is not that influence.

8. What are the decision making activities in decision making process?

A: Already mentioned.

9. What has GLIS historically been used for? From when decision making process has been a service/target of GLIS?
A: I do not know really, but I suppose we have to report from beginning because the government also wants reports and they want us to tell what we think about things and so on.

10. Who are the users of GLIS? Do all or some of them use it for decision making activities?

A: Administrators, and most of the staff use GLIS sometime, and some persons use it more regularly like Eva. I think most people use GLIS as some kind of base for decision.

(Q: You get some reports from GLIS, and use them for decision making?)

As I said before it is important to understand that it not just the figures that are important when you make decisions there are other factors that can influence decision making sometimes even more than figures for example what the government says.

11. Do you recommend us any document to read related with GLIS?
A: No, we do not have any.

12. Do you have any other comments?
A: No comment.

- Evaluation

13. Who implemented GLIS and who is responsible for the maintenance of it?
A: Omitted.

14. To what degree does GLIS fulfill your expectations? (What is about the cons with it?)
A: I am happy with the system in general. The reason I (Anna) do not use it very well, I went to GLIS course and after while I forgot how to use it. I think it could be more pedagogical build, it is difficult to navigate in it, a lot of functions and it is not that evident how to combine different parts of GLIS to get the result you want I guess.

(Q: Can you tell us (one) Problem with GLIS and your suggested Solution to that problem?)
Already mentioned.

15. What are your future needs for GLIS?
A: Already mentioned.

- Next person

16. Who are the next person(s) you recommend us to interview that helps us in this research?
A: Omitted.

Respondent 7

- Respondent

1. Can you tell us something about yourself? (name, job position, tasks, background, etc.)

A: Krister Ågren, “Utredare” (administrator for GLIS)
I have been working at UU: planning division since March 2012. I am a statistician that for the last 6 years been working with BI at SLU (Swedish university of agricultural sciences). I have also recently quit my job and start this September at “University” (Högskola) of Gävle.
2. Can you tell us about the Use of GLIS?

   **A:** The purpose of GLIS is to collect data from many different sources (mainly databases) and present this data on a single site.

   GLIS is used by many people. Everything from analysts in central positions to scientist who wants to keep track of their project funding.

3. For about how many years have you used it?
   **A:** A little more than one year.

4. How frequently do you use it?
   **A:** Every day.

5. In what way it is beneficial to adopt a BI system, GLIS, in Uppsala University?

   **A:** UU is a large institution that needs to have an overview of many different kinds of data. This is very hard to do and very time consuming if you are using a lot of different data sources. I think that every medium- to large size company/institution would benefit from a BI system.

6. For which purpose do you use GLIS? (like Students admission, Education (Basic/Advance level), Education (PhD), Publication reports, Staff reports, Economy/Finance reports, University premises, Gender Indicators of Uppsala university, etc)

   **A:** First of all I maintain it so that others can use the data. I also use it for my own analyses to that extent that it can be used.
7. How may the adoption of GLIS influence the decision making process in Uppsala university? Which factors (like time, hardness, quality, etc.) are affected in what ways?

A: If you put all different kinds of data a university uses together in the same system it will (of course) have positive effects. If people get a good overview of data it is easier to spot errors and correct them. An information system also (especially if properly built) cuts analysis time greatly when data is presented in an “easy-to-use” kind of way instead of being retrieved from different databases. On the downside people have a tendency to over-analyze things when data is easy accessible.

8. What are the decision making activities in decision making process?

A: I am not sure that I understand the question. If you mean the decision making activities in GLIS it is the same kind of analytics that you would do from a regular database. It is just much easier to handle.

9. What has GLIS historically been used for? From when decision making process has been a service/target of GLIS?

A: Both for basic data/information for the staff at UU and decision making. I think that GLIS (and most BI-systems) have decision making processes as a primary target at the very start. If the data doesn’t help you in any decision at all, do you really need to look at it?

10. Who are the users of GLIS? Do all or some of them use it for decision making activities?

A: The users of GLIS are represented in almost every level of employees at UU. I think (or hope) that most of them use it for decision making.
11. Do you recommend us any document to read related with GLIS?

A: GLIS is extremely poorly documented. There is no comprehendible document that I know of except the presentation that is included in this mail.

12. Do you have any other comments?
A: No.

- Evaluation

13. Who implemented GLIS and who is responsible for the maintenance of it?

A: Mats Olsson implemented GLIS and I am responsible for the maintenance. But, since I recently quit my job someone else will take over very soon.

14. To what degree does GLIS fulfill your expectations? What is about the cons with it?

A: Maybe 3 out of 5? GLIS is today strongly associated with the software “Diver Solutions” so my comment will be about that software. It is a good tool to show tables, graphs and documents on the university website but it lacks power when it comes to usability as an analytic tool. The software “engine” is slow and has annoying limits in data quantity.

(Q: Can you tell us (one) Problem with GLIS and your suggested Solution to that problem?)

The software is kind of poor with long response times and cumbersome administrations routines. The solution would be to change software.

15. What are your future needs for GLIS?

A: When it comes to data I would say anything that isn’t already there and that the university needs to analyze or take (several) decisions within.
16. Who are the next person(s) you recommend us to interview that helps us in this research? (Except: Leif Eriksson, Joakim Löfkvist, Mats Olsson, Björn Wiberg, Michael Petrén, Anna Hagborg, and Ewa Holmqvist.)

A: As I understand, you already have the interviews that you need.

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*The End*