Business Intelligence in Uppsala University:
Do academic institutions practice what they preach?

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Master programme in Information Systems.
Spring term 2015.
Abstract

Business Intelligence (BI) is not a new concept. However, it is still complicated to work with it due to the different views and ways of implementation. This study has adopted an organisational oriented approach of BI: *getting the right information, to the right people, at the right time*. It was found in this study that poorly implemented BI features and inadequate information infrastructure may lead to workarounds in order to compensate for missing or lacking features and systems.

This case study has been conducted at the faculty of Social Sciences of Uppsala University (UU) where a set of interviews were conducted to individuals on one of the key positions at the university; the Director of Studies (DoS). The aim was to map out the key processes and head activities of the DoS’s and evaluate them through the BI view of this thesis. Being the conclusion a concrete mapping of the DoS head activities as well as BI assessment of the current situation of the studied departments. Some improvements have been proposed in order to remedy the lacking of valuable and critical features and systems. However, it was found that the current system infrastructure and problem area is too immature in order to implement any form of integration. Several studies on key positions and influential systems need to be conducted in order to exhaustively map out and discover the problem area.
Acknowledgments

We would like to thank all those who gave us their support in order to complete this thesis. Special thanks to our supervisor Steve McKeever for his help during the whole process where he nourished us with his knowledge and experience, and for all his feedback and suggestions of improvement.

Big thanks to all the interviewees for their time and guidance. Accomplishing this thesis would not have been possible without their input.

Finally, a special mention to our families and friends for their always unconditional support and motivation.

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I would also like to express my eternal gratitude to the Erasmus Mundus PEACE programme for granting me the scholarship that supported my Master studies in Uppsala, Sweden.

Gastón Bakkalian
## Contents

1 Introduction ......................................................................................................................... 6
   1.1 Problem Overview ........................................................................................................ 7
   1.2 Methodology .................................................................................................................. 9
       1.2.1 Research strategy .................................................................................................... 9
       1.2.2 Research execution approach .................................................................................. 9
       1.2.3 Data collection ...................................................................................................... 10
       1.2.4 Data analysis ........................................................................................................ 10

2 Background .......................................................................................................................... 11
   2.1 Business Intelligence ..................................................................................................... 11
       2.1.1 A Business Intelligence introduction ....................................................................... 11
       2.1.2 A Business Intelligence definition ........................................................................... 12
       2.1.3 Intelligence based decision making .......................................................................... 13
       2.1.4 Data structures and tools ....................................................................................... 14
   2.2 University economics and budgeting .............................................................................. 14
       2.2.1 The value of the education ...................................................................................... 15
       2.2.2 A Business Intelligent mindset ............................................................................... 16
       2.2.3 Business Intelligence summarization ...................................................................... 17
   2.3 Uppsala University Infrastructure ................................................................................... 17
       2.3.1 Current Information Infrastructure ........................................................................... 18
       2.3.2 Remedying attempts .............................................................................................. 19

3 Budgeting and Planning ........................................................................................................ 20

4 An intelligent business ......................................................................................................... 29
   4.1 The activities life cycle ................................................................................................ 29
       4.1.1 The budgeting dilemmas ......................................................................................... 30
       4.1.2 The planning dilemmas ......................................................................................... 31

5 Conclusion ............................................................................................................................ 33
List of Figures

Figure 2.1: Right Information to the right people at the right time ...........................................13
Figure 2.2: Evolution of Business Intelligence ...........................................................................13
Figure 3.1: Current year annual budgeting (DoS) cycle participation ......................................21
Figure 3.2: Course budgeting (DoS) cycle participation ...............................................................22
Figure 3.3: Course planning (DoS) cycle participation .................................................................23
Figure 3.4: Course budgeting/planning (Head Teacher) cycle participation ...........................24
Figure 3.5: Finalization of a course (Head Teacher) cycle participation ...................................25
Figure 3.6: Execution of a course (Head Teacher) cycle participation ......................................26
Figure 3.7: Budgeting and Planning cycle ..................................................................................28
Figure 5.1: Course budgeting (DoS) suggestion of improvement .............................................34
Figure 5.2: Course planning (DoS) suggestion of improvement ...............................................35
Figure 5.3: Course budgeting/planning (Head Teacher) suggestion of improvement ............36
Figure 5.4: Budgeting and planning cycle with improvements ...............................................37
1 Introduction

According to Buckingham et al (1986), an Information System (IS) is “a system which assembles, stores, processes and delivers information relevant to an organisation (or to society), in such a way that the information is accessible and useful to those who wish to use it”. By the means of using an IS, the information could be used to support operations, management and decision making process within organizations (Davis and Olson, 1984).

Information is one of the most essential and valuable resources modern organizations can retain and is something every organisation is depending on (SIS[27000], 2014; Eloff and Von Solms, 2000). The perspective on electronical information as a central asset is also impacting the attitude organizations have towards business practices (Choobineh et al, 2007). In general for the human being, counting with rich information has become an indispensable factor of success among all kind of disciplines (Tvrdikova, 2007).

One way to make use of information is through the implementation of Business Intelligence (BI); which is a method used for acquiring and applying knowledge. BI has been increasingly popularized and adopted by organizations in the recent years (Safeer and Zafar, 2011).

Universities are not an exception to these cases. Nowadays the same reasons that could derive in a deficient management of a business company are the same that deprives Universities of the opportunity in achieving their primary objective of providing a high quality education; due to the fact that their main processes share common ground. (Dell’Aquila et al., 2008)

A critical component for the success of the modern organizations is its ability to take advantage of all available information. This becomes more difficult with the constantly increasing volume of information both internally and externally. (Cody et al., 2002)
1.1 Problem Overview

It has been established since years back that the information infrastructure of Uppsala University (UU) is inadequate (Fiske and Eklund, 2013). It has a large array of disparate and poorly linked tools, used to support the employees and their decision making processes (Lundberg, 2009).

The main issue is that many of the employees lack of good supporting structure, routines and tools to efficiently carry out even the simplest tasks. What is worse, is that employees in key positions within the university lack this kind of support as well. In the practice this concludes in workarounds of important functions exercised by the employees, such as manual work or inefficient trade-offs in the form of bad tools; causing added and unnecessary workload. The result being an overall reduced performance of the university as an organisation.

The complexity of the problem is rooted in the intricate nature of the university structure. The lacking of non-standardized working practices and routines, as well as the relatively low coherence between departments, adds to the complexity of providing a solid and intelligent approach for handling the organisational business.

UU has a large number of different systems and processes at the separate institutions. There is inadequate clarity about what, how and when decisions are made and what type of information and systems are involved in the process. Based on this, there is reason to explore and identify which routines are in place, what information and which systems are used in decision-making. There are also popular beliefs amongst employees in that the systems are too many and some are not even made for them; some of which are hard to operate and workarounds are created to supersede them, providing additional motivation for this study.

Taking the previous into account and the fact that little research has been conducted about BI in UU, this study will address the problem regarding the decision making process in UU by the use of BI. The purpose will be to map out the existing problems or hardships that might arise when implementing and practicing decision making in organisations like UU through a BI perspective. It will focus on the faculty of Social Sciences at the level of the Director of Studies (DoS). The
reasons for choosing this particular segment were mainly because the authors are students at this faculty and also due time constraints.

In particular, this thesis aims to analyze the current responsibilities and tasks of one of the key employees of the institutions; evaluating their tasks through a BI approach. Through this, establishing and formatting the information system used by the employee in a concrete manner. As well as producing suggestions of improvements and appraise the current situation of UU and advised course of approach from a BI perspective.

The result of this thesis suggests that the actual BI implementation and information infrastructure do not sufficiently support the decision making process in the studied faculty at UU. In addition, it was found that the faculty is currently not yet ready to take the step of introducing any kind of modification in the systems or infrastructure. Hence, further research must be conducted before any change takes place. For instance, defining the flow of information objects between users and systems and verifying the structure of databases and source systems.

Another conclusion that can be drawn from this study is that inefficient workarounds have been established in order to supplement currently missing and lacking system features. The current systems are, in other words, failing to supply employees with *the right information, to the right people, at the right time*, in order to accomplish their tasks.

The outline of the thesis is as follows: Chapter 2 involves the background that is used as the theory to guide the whole study. Next, chapter 3 includes the data got from the interviews conducted where the analysis of these is presented in chapter 4. Finally, the thesis is summarized with the conclusion and proposed suggestions for future research in chapter 5.
1.2 Methodology

This section explains the research methodology used when conducting the thesis.

1.2.1 Research strategy

Since the aim was to generate qualitative information from a specific organisation, this study qualifies to be a qualitative case study (Oates, 2006; Yin, 2013). Additionally, taking into account that the study has no clear hypothesis, it motivates the choice for an explorative approach of the case study (Yin, 2013; Baxter and Jack, 2008).

The generation and construction of theory is largely based on Eisenhardt (1989) and Yin (2013) research on creating theories in case studies. The main goal of the theory was to act as an accurate base for the study. The theory acted as an initial point of approach for the sorting and collection process of the empirical data (Oates, 2006).

1.2.2 Research execution approach

Initially a comprehensive literature study was executed to map out the necessary knowledge base. The main goal was to first and foremost gain knowledge and know-how of the subject at hand (Bowen, 2009). Such as understanding the current and historical view of BI and how it is situated in modern research; together with how BI is practiced in organisational structures similar to the UU. In addition, the review aid in defining the terminology of the study which promoted perspicuity in the research, as well as discovering and defining interesting interview questions that would be of relevance for the upcoming data collection (Oates, 2006).

Document studies are commonly used in combination with other qualitative research methods (Rowley, 2002; Seale, 1999). These were used to mainly understand the infrastructure of UU, such as which systems are implemented, key subjects and some basic routines.
1.2.3 Data collection

The data collection was done through unstructured and semi-structured interviews with several identified key subjects working at UU. The collected data was then analyzed in accordance to the theory, ultimately leading to the conclusions presented in the end of this study.

Two sets of interviews with different goals were conducted (see the questions in the Appendix A). The initial set of unstructured interviews was conducted because there was a need to create a deeper understanding of the current situation of UU. The subsequent set of semi-structured interviews aimed to collect empirical data from key subjects.

The interviews were recorded to correctly reproduce the information and statements at a later stage in the study. The interviews were in addition selectively transcribed to highlight the most interesting information for further analysis.

1.2.4 Data analysis

The collected data from the initial interview were analyzed to produce a more general understanding of the study subject. The second round of interviews was analyzed in accordance to the theory that was developed for the study.

Since the data generated from the data collection was more or less exclusively qualitative data, a segmentation approach was adopted to classify and arrange the data (Oates, 2006). The empirical data was then to be used when searching for patterns and explanations for some of the phenomenons that arose during the study.
2 Background

The aim of this chapter is to build the foundation that will be used to support the analysis of the obtained empirical data.

The chapter begins with the definition, application area, and benefits of Business Intelligence (BI). Then, an overview of the economy and budgeting of the universities in Sweden focus on Uppsala University is presented. Finally, the chapter ends with an explanation of the current information technology infrastructure of the university, which is vital background information that this thesis builds upon.

2.1 Business Intelligence

The concept of BI is, even today, fuzzy and has multiple interpretations with an array of application areas and means of concrete practice. This section introduces and explains the role of BI that this thesis has adopted.

2.1.1 A Business Intelligence introduction

Even though there have been clear gains from processing and handling the massive amount of data in terms of intelligence, there is also a cost associated with these activities in the form of both human and technical assets within organizations. Thus, BI has become more useful for organizations decision making since the availability of methods and applications have increased. (Safeer and Zafar, 2011)

The use and importance of BI is reflected in the fact that it ranks as top priority to achieve business innovation among others (Watson and Wixom, 2007). Even organizations which already had previous success from implementing BI still search for new opportunities in improving themselves further (LaValle et al., 2010).
2.1.2 A Business Intelligence definition

There is no well-accepted definition of BI (Watson, 2009). Based on researchers, the concept of BI has different meaning to different people for being this a content-free expression (Sharda et al., 2015). It can for instance be viewed as a wide term, incorporating many features, activities and processes such as data warehousing, data mining, analytics, reporting and visualization technologies, tools and practices (Dayal et al., 2009).

According to Sharda et al (2015), BI is “an umbrella term that combines architectures, tools, databases, analytical tools, applications, and methodologies”. Negash (2014) argues that BI “...combines data gathering, data storage, and knowledge management with analytical tools to present complex internal and competitive information to planners and decision makers”. However, one particular definition that this study believes embraces the whole concept of what BI incorporates is mentioned by Bogza and Zaharie (2008), “getting the right information to the right people at the right time”.

Due to the fact that this thesis aim is mainly concerning the target business on an organizational level, the latter definition has been chosen as the foundation of this work. This term facilitates all the required capabilities in order to convert data into intelligence and through the use of this take more efficient decisions (Bogza and Zaharie, 2008).

The right information incorporates information correctness and source rigor into our BI definition. It has very little worth if the active entities cannot take part of the information and make use of it. The right people signifies the source distributor and recipient and to whom a specific piece of information is vital in order to take efficient business decisions. Lastly, the right time represents the timing of the information flow. The latter is of paramount importance due to the fact that even though the right information reaches the right people it has little to no worth if the information is received post crucial timing. Resulting this in less efficient decision making, as well as potential loss in revenue and other possible gains.
Information is usually obtained from different aspects that are of interest for the organisations, such as decision making processes, economics and technology. Figure 2.2 (Sharda et al., 2015), shows several tools and techniques included in the most sophisticated BI products:

2.1.3 Intelligence based decision making

It is important to emphasize that the main objective of BI is to aid on the decision process within organizations to provide a competitive advantage. Furthermore, it seeks to enable access and
manipulation of data, therefore appropriate analysis must be conducted so that complex information can be presented to the decision makers in order to take high quality decisions. This can be achieved by combining operational data with analytical tools which allows historical and current data analysis (Sharda et al., 2015; Negash, 2004).

2.1.4 Data structures and tools

BI makes use of both structured and unstructured data. However, they have their differences when it comes to pros’ and cons’. Unstructured data (which in most cases represents over 80% of company's information assets) continues to be an issue in BI and it is of paramount importance to be able to handle it because it provides valuable contextual information in order to take more informed decisions. Common forms of unstructured data are for instance emails, images files, video files, business processes, letters, phone conversations, web pages, etcetera. (Negash, 2004; Dayal et al., 2009)

Direct benefits gained from applying BI in organizations are lowering the costs of IT infrastructure thanks to the removal of unnecessary data extraction processes, the improvement on data delivery saves time for suppliers and users, and could help entering new markets or launching new products. (Watson and Wixom, 2007)

2.2 University economics and budgeting

This aim of this section is to explain the somewhat complicated structure of Swedish universities, the value of education and university funding. Also, how BI can be used to aid and measure current situations of educational entities. All the information was taken from Swedish sources and re-written in English with the authors’ own words.

Swedish universities are complex businesses. They are tasked with conducting and administering education, together with executing scientific and artistic research (Regeringskansliet, 2015). It is therefore of great importance that the businesses of universities are conducted in a proper manner, based on scientific methods.
At the same time, universities are evolving around economics and can therefore, to some extent, be viewed as any other orthodox business.

2.2.1 The value of the education

The universities shall co-exist with the surrounding society, inform about its activities and also make efforts towards making use of research results. The activities shall be carried out in such a manner that there exists a close connection between research and education. The activities shall moreover keep a high standard and aimed to be competitive internationally. Sweden's assurance for growth, business, and future prosperity is intimately connected to the quality of university education and research (Regeringskansliet, 2015).

Today, Swedish universities have three main sources for financing their businesses: government budget grants (directly from the government and parliament), contributions (from government research councils and private foundations), together with fees and other compensations (such as educational fees and commissioned enterprises). The government is currently the biggest overall contributor which stood for more than 80 percent of the total financial aid. The sources are divided and accounted for in either bachelor and advanced education level or research level. (UKÄ, 2014)

The system for finance where government involvement exists, includes to a large extent the number of students, their completed credits and the grading on these credits (UKÄ-3, 2014). The totality of the financial aid is decided annually through a calculation of these student attributes, concluding in a budget roof decided by the government. However, the amount can fluctuate depending on the different areas of education. (UKÄ-2, 2014; UKÄ-3, 2014; UKÄ-4, 2014)

An analysis by the Swedish agency for higher education (HSV, 2011) asserted that there were approximately 315,000 full time students studying in universities in Sweden in the year of 2010, breaking the record amount of full time students. To meet this increasing stream of applicants, the Swedish government granted an increase of the budget roof for many universities. In addition to the increasing number of applications, the economic surplus of the higher education institutions were also greater than ever before. Every university except five that were part of the
analysis showed positive results, one of these being UU. The number of full-time student applicants has been since 2011 steadily increasing, granting even higher budget roofs for the educational institutions (UKÄ, 2014).

Organizing the university business can prove itself difficult since it is so dependent on the volume of student education and its composition. The more “expensive” the education, the fewer spots available for full time students. The same goes for the grading on credits, the higher the performance, the more the budget roof has to be divided between these. However, even if these factors play a big role in budgeting the universities, the biggest influence is still being how the government chooses to regulate the budget roof. (UKÄ, 2014)

2.2.2 A Business Intelligent mindset

All contemporary businesses are looking for ways to utilize effective information systems to increase their efficiency and obtaining a competitive advantage over their adversaries (Linn et al., 2009). It is not uncommon to view the management of an educational institution as critical as the management of a big business companies, the reason for this is that the factors for achieving optimal management are the same for the both (Wierschem et al., 2003).

Businesses that want to retain that competitive advantage are expected to implement a BI solution. This also aids the business in lowering operational costs as well as the integration of internalized and externalized data, the interpretation and processing of that data, ultimately achieving benefit (Linn et al., 2009; Tvdíkova, 2007). High quality of work with increased simplicity in the decision making process are only some of the benefits when incorporating a BI solution (Tvrdíkova, 2007).

Especially at universities, according to Dell’Aquila et al (2008) and Muntean (2011), top authorities expect that BI can aid in:

- Develop a high quality education.
- Achieve a proper management of all human resources independently of their role.
- Maintain a stable economy.
- Analyze students’ unemployment rates after finishing their studies.
- Analyze students and employers expectations.

In concrete, educational entities from a business point of view, tend and attempt to control the student flux, their expenses (such as salaries, taxes, etcetera), and the teaching staff workload distribution (Dell’Aquila et al., 2008).

2.2.3 Business Intelligence summarization

From the BI information presented above and the definition of followed in this thesis, there is little evidence supporting that Uppsala University is utilizing BI in a proper manner (see 2.1 Business Intelligence).

In general, BI can support organizations in maximizing budget allocations through taking wiser decisions (Lupton, 2010). And as Lupton (2010) so cleverly puts it, “Embarking on the BI process is not easy, but it is worth the time and energy to utilize this approach.”.

Measuring the benefits of BI practices is not always apparent and straightforward. Normally, companies attempt to measure BI profit in order to determine the investment worth in retrospect. Measurements are also conducted to manage the products and processes themselves according to the achieved user satisfaction. (Lönnqvist and Pirttimäki, 2006)

2.3 Uppsala University Infrastructure

This section is based on previous research projects conducted at UU where the current information technology infrastructure is introduced. Then, problems that have been found and solutions to overcome these are presented.

Even though in general the users claimed to be satisfied with the current systems, most of them were forced to implemented workarounds as a consequence of the high fragmentation between systems and the limited features of these. To solve this problem, a core system that integrates all the necessary ones was suggested.
2.3.1 Current Information Infrastructure

UU is using an array of different tools to support employees, students and decision making (Lundeberg, 2009).

Several research projects have been conducted on UU IT-support, UU’s different tools, the overall decision making process where the Director of Studies level has been reached. These indicate that there are several gaps that need to be filled with the general system infrastructure of UU. (Backström et al., 2013; Lundberg, 2009; Fiske and Eklund, 2013; Ezdri and Lindborg, 2013; Lind et al., 2011).

Fiske and Eklund (2013) argue that UU’s local IT support system needs to be revised due to its complexity and its shifting quality. In addition, Backström et al (2013) are hinting on their paper that some aspect of the decision support systems can be viewed as inadequate within the university.

In many cases the decisions are made by employees that need to root themselves in a supplementary workaround due to the insufficient features of the systems (Backström et al., 2013; Olausson, 2013). However, researchers call attention to the fact that most of the users are to a large extent pleased with the current systems (Backström et al., 2013; Olausson, 2013; Lundeberg, 2009).

The conclusions that all these researches have in common is that the current infrastructure is insufficient and in many ways incapable of supporting employees both internally and between institutions. In addition, many of the researches about UU indicate that there is a severe fragmentation of IT support systems (Fiske and Eklund, 2013; Lundeberg, 2009; Backström et al., 2013; Ezdri and Lindborg, 2013; Lind et al., 2011). Determining that UU would greatly benefit from an organisation wide system with support that covers all institutions. Ultimately generating an infrastructure that is more transparent and homogenic.
2.3.2 Remediing attempts

Moreover, Malmstedt (2014) who based his work on the research carried out by Fiske and Eklund (2013), argues that the main problem of UU infrastructure is that the actual systems do not support the business activities accordingly. As a consequence the employees are compelled to carry out a lot of manual work such as sending requests and reports by email, storing sensitive information and performing calculation in excel spreadsheet, arranging the definition of tasks by word of mouth, among others.

In order to deal with this issue, Malmstedt (2014) designed a prototype of an Activity Planning System which was proposed by Fiske and Eklund (2013) as a possible future research. This system was intended to fit in the actual environment from an infrastructural perspective. It will be the core system and intended to be a single point of entry by exchanging required information with the other systems. The main focus of the system is to support the DoS and Teachers administrative tasks, also incorporating an activity planning level where the head teachers could set each activity (lectures, labs, examinations and so on), the time, the length, the teachers, the room, etcetera (Malmstedt, 2014).

This system could be seen as an important part of the puzzle to address some of the inherent problems introduced above. However, this attempt lacks some vital background information and is therefore not solely a satisfiable solution at this moment. There is not sufficient knowledge of the current organisational infrastructure of the users, such as the flow and timing of information objects, the explicit mapping of head activities and interacting users. Some of these issues are presented and discussed at later chapters.
3  Budgeting and Planning

The aim of this chapter is to describe the evidence that has been found by executing the data collection step focus on the annual operations of the Director of Studies (DoS) and the sub processes included in these.

The data has been collected from interviews conducted with two different DoS from the Faculty of Social Sciences. The following chapter will analyze and map the data in accordance to the theory presented above.

The chapter describes each process related to budgeting and planning at the department level. This is followed by a summary, highlighting the main activities of each process, including its participation on budgeting and planning. It concludes with a cycle built up by the separate processes previously presented.

Director of Studies responsibilities

The DoS main responsibilities are to plan, create, monitor courses and determine the different course offerings at the department. These responsibilities are divided into a large array of processes, some of which are more important than others. Amongst others, the most important processes includes aggregating information about admitted students to courses, planning courses and teacher hours according to budget, scheduling, and following up on courses.

Current year annual budgeting

The activities begin with establishing a budget plan for the entire department. The budget is usually estimated annually and done through determining the quantity of assigned full-time study seats for the current year and subject. This is directly connected to the available fundings allocated for each faculty. Usually, the DoS is supported by someone who is in direct contact with the needed system in order to be able complete this task.
Main activities
- Collecting budget basis (government budget roof, etcetera).
- Calculate expenses and revenue.
- Aggregate full time student information.
- Conclude subject course offering.

![Figure 3.1: Current year annual budgeting (DoS) cycle participation](image)

Course budgeting Director of Studies

On the course level, the calculation of the budget is done through the distribution of available teaching hours allocated for that course taking into account the student seats.

The amount of teaching hours can fluctuate between semesters if it is decided that some other courses are to be prioritized. When this is done, a budget for each course instance is created and is, at a later stage, shared with the teachers by email or physical paper copies. This activity is one of the most important decisions that has to be made before each semester.

Main activities
- Aggregate full time student application information.
- Determine the course priority for the next teaching year.
- Distribution of teaching hours course funding.
Thereafter follows the course planning stage where information is extracted by different means about available teachers and teaching hours of each of them. The DoS might need to shift resources; such as which employees are to be a part of the course. In some cases the planning needs to be done sporadic due to, for instance, researchers receiving research grants with short notice and therefore do not have the opportunity to teach on future courses.

Which teacher is going to be responsible of the course and which will teach is then discussed between the available teachers and the DoS. This could be done either on formal or informal meetings with the teachers or also sending an inquiry (through email) to all the teachers to establish who is interested in which course (getting the response back by email or paper). Taking into account that information, the DoS selects the head teacher of the course and the teachers candidates which are then put into a matrix (paper or excel spreadsheet).

The planned hours for each course are then distributed to the respective teachers in the form of an excel spreadsheet or in the PM system (depending on the DoS). The system mentioned before belongs to one of the departments and allows the DoS to conduct the planning at a course level where the Dos can input the amount of hours that a specific course will need, but it does not reach the activity planning level needed by the head teachers. The planned hours for each course based is based on both the total number of planned hours for the course instance and the total
number of hours that each teacher has to fulfil. When all the calculations are finalized, decisions can be made whether there is sufficient teaching hours or if another teacher is needed to fill in the missing hours. Before the course starts, the DoS sends the respective course plan via email to the head teacher of that course.

Main activities
- Aggregation of information regarding interested teachers and their positions.
- Initialization of the course planning (on hold until the information about the teachers is completed).

![Figure 3.3: Course planning (DoS) cycle participation](image)

Course budgeting/planning Head Teacher

The head teachers then have the responsibility to handle the budget of a course. This budget is based on assessing the costs of activities in a course, such as lectures, labs, examinations, etcetera. The budget process includes planning these activities and the distribution of the teachers.
Course activity budgets are then calculated based on the information produced from the DoS. The budget needs to be calculated with regards to a course as an instance, including expenditure such as teaching rooms and personnel.

Furthermore, if any exceptions occur such as substitutes teachers are needed, the one that usually takes care of this issue is the DoS who is reported by the head teacher. In some specific cases that an immediate solution is required or that a teacher is going to be absent for a short period of time (one or two days), the head teacher could resolve the situation himself. This is done under the premise that the decision does not overrule any previous one taken by the DoS.

**Main activities**

- Determine the activities of the course.
- Distribution of the activities to the teachers of the course (send to DoS for approval).
- Finalization of the course planning.

![Figure 3.4: Course budgeting/planning (Head Teacher) cycle participation](image-url)
Finalization of a course

A course is finalized when the head teacher of a course has worked out and completed all the course activities (as well as the ones assigned to concrete teachers). As previously mentioned, the realization of a course is halted if any exceptions occur which needs the DoS input.

Main activities
- All course activities are set.

Figure 3.5: Finalization of a course (Head Teacher) cycle participation
Execution of a course

After a course has been decided it is then admitted and executed by the head teacher. There is constant feedback with the DoS about course progress. If an anomaly occurs it will be discussed between head teacher and the DoS until it can be resolved.

Main activities

- The activities of the course are executed until all of them are completed.

Figure 3.6: Execution of a course (Head Teacher) cycle participation
**Follow up of a course**

After a course is completed a follow up on the result of the course is summarized by the head teacher containing the numbers of hours invested in the course. This is commonly done through the head teachers sending a report back to the DoS, usually in excel format. The invested hours are then compared to the number of hours initially allocated for that course. In some cases the results are manually entered into a system by either the DoS or the head teacher. In other cases, the results are manually updated on an excel spreadsheet by the DoS.

The concluded data about a course produced by the head teacher follow ups is then used for planning the upcoming study semester. Some of the money comes simply from registering for a course, and some will be based on how many people passed the course. The results are then reviewed by the DoS, such as the difference between the budget and the actual outcome, so that it can be adjusted for next year budget.

**Main activities**
- Course completion report (sent to DoS).
- Real invested hours compared to initial allocated hours.
The whole cycle including all the processes is graphically shown next in figure 3.7:

**Figure 3.7: Budgeting and Planning cycle**
4 An intelligent business

This chapter describes, examines and discusses the theoretical and practical aspects, features, and attributes that influence the DoS decision making activities at the faculty of Social Sciences of UU; as well as the implications that might arise from these and how are they related to the BI view of this thesis.

4.1 The activities life cycle

We have learnt in the literature review that BI in organizations can be characterized by different means. In this thesis we have chosen to interpret BI as a process where the right information, gets to the right people, at the right time; where BI acts as a supporting feature in an overall structure. We believe that this is a fundamental part in achieving an effective and profitable decision making process.

From a larger perspective, the responsibilities of a DoS essentially boil down into two big categories: Budgeting and Planning. Furthermore, when viewed in the light of routines and tools there are differences between the two interviewed DoS’s even though both of them belong to the same faculty.

Most of the tasks that a DoS position entails are being supported by someone else who finally relies on a specific system. The reason for this is mainly due to that the systems are not explicitly developed for a DoS usage. This leads to a lot of manual work for the DoS, involving the use of unstructured data, such as paper or emails, instead of a more structured version of the data. Because analyzing this data type requires more complicated techniques, it increases difficulty and complexity concerning the decision making process.

As seen in the previous chapter discussing BI data types, handling unstructured data presents difficulties. However it is of paramount importance to apply an approach which tasks itself with dealing with this issue, resulting in valuable material for carrying out better decisions.
Some of the most important decisions require the DoS to make calculations, most of them done ad hoc and through the use of excel spreadsheets. For instance, there is no implemented system that supports the execution of these calculations nor storing this sensitive information. This is based on the fact that there is no infrastructure that supports the business activities, meaning that DoS has very little to say in how the activities should be executed.

4.1.1 The budgeting dilemmas

Planning the annual budget is the most crucial component in the overall decision making process of a DoS. It is also evident from observing the cycle of DoS decision making that this is the core of the activities; and the success of the upcoming activities stands and falls based on the rigor of this one. Other activities such as calculating the final budget for each course will indirectly be affected.

At this level some of the problems with the current work practises become apparent. There is good support for creating subject level budgets but not really implemented routines or systems that aids a DoS on course level budget. For instance, the only information that is obtained from a system (Uppdok) is the number of applied students that could be used as a guide to elaborate the budget.

Budget decisions are calculated to a large extent based on assumptions from the previous year numbers and intelligence gathered from statistics generated by systems like GLIS. The system mentioned before is a BI tool used in UU mainly to support the university management, planning and decision making process. To produce an acceptable number the educational entities will try to adjust and control the student flux, such as the final number of admitted students. Despite this, the course budgets can only be roughly calculated based on the intelligence. Since there is no system feature that can support this task, once again it is leading to workarounds. According to the BI definition that has been adopted in this paper, it becomes clear that the fragment of getting the right information is not being fulfilled here because the source of information that is used to execute this kind of tasks is not reliable.
Before completing the final course budget in the form of teaching hours, the amount of student seats allocated for a specific course must be finalized. This number could vary from year to year and between courses and levels, such as bachelor and master, in order to fit the current needs of the department.

There are indications that UU can, from some aspects, be viewed as a business. This is based on the fact that bachelors are considered to be worth more than masters. Bachelor's need more teaching hours to graduate. For example, the more bachelor students seats, the more the teaching hours needed, the more the money invested. However, the yield of this investment is much greater than even putting the minimum amount of teaching hours required for a master group to graduate. And as stated before, the numbers of students is one of the factors that the government takes into account when deciding the budget roof.

When the course budget finalized it is sent by email or hard copies, either of which has a chance of failing to reach the receiver. Emails can be sent to the wrong person or the wrong version can be sent. Hardcopies can be easily misplaced. In addition, if modifications are needed, the emails or the hard copies will go back and forward leading into an added complexity and high inefficiency.

4.1.2 The planning dilemmas

The lack of solid infrastructure and supporting systems extends itself to this level as well. Weak or nonexistent routines and systems once again force the DoS to do manual work in order to accomplish the process. Consequently, this leads to some ambiguity in the work. Many of the deep routines are rooted in supplementary work around weak or nonexistent systems and routines. Compelling DoS’s and teachers to carry out many of the tasks manually that can easily be performed by a system or better routines. An example of this is when the head teachers once again has to do calculations of the previous year’s budget in order to do activity planning, taking into account the result of previous year’s budget and the input of the teachers themselves at some extent. One of the routines in place here is holding formal or informal meetings, or sending inquiries by emails to determine the head teacher and teachers for a specific course by the DoS. These routines and the absence of aiding systems results in added inefficiency issues.
Consequence that might arise from this is for instance, not getting the right information, to the right people, at the right time.

On the one hand, one positive feature implemented as a part of the DoS decision making activities is the ability to set the planned hours by using one of the systems. This is a great advantage for the DoS using this system feature in comparison to just distributing them in an excel spreadsheet. In addition, since the numbers are stored in the system, they are available for every teacher to consult them without taking the risk of misplacing any paper or having an out of date version of the teaching course budget and planning. Furthermore, having these as structure data promotes ease of use and the possibility of performing further analysis if needed.

On the other hand, there is lacking support when it comes to course activity planning and assigning them to specific teachers. There is no system infrastructure that supports these kind of activities. The high fragmentation of the many UU IT support systems does not improve this situation.

The Activity Planning System proposed by Malmstedt (2014) was an attempt to solve this solution. The main idea of the system is to create a single point of entry for viewing information. The system is to act as a portal, fetching relevant information from disperse IT systems to the user.

A forte of this system that it will allow the head teacher to work on the deep level of the activity planning. Such as setting the different activities with their corresponding attributes; for example type, length, teacher, and room. The system will also implement DoS level assistance, aiding with their activities related to budgeting and planning.
5 Conclusion

This last chapter concludes with the final thoughts of the thesis and it presents the suggested improvements. Furthermore, the chapter also gives suggestions on further research and describes concluding remarks on the author’s views about the current situation of UU information infrastructure.

5.1 Final thoughts

The result clearly shows that a BI approach is not supported in the current decision making process at UU. The current situation proved to have a variety of practices and routines spread out on a large number of departments within UU.

The systems are currently failing to supply employees with the information needed to fulfil their daily tasks from a BI perspective. At times the systems are non-existent or too complex to implement in the everyday work. Therefore, workarounds have been created to mend the evident problems. This leads to the unmistakable general conclusion that poorly implemented BI routines and tool support prompts ineffective workarounds as a substitute.

Many of the systems do not contain any valuable information that can aid the users in doing planning and budgeting, presenting a main shortcoming at the faculty level. These activities can only, at present day, be done “effectively” in form of excel sheets; consequently claiming much more energy when combining them. From the aspect of viewing UU as a business, these workarounds take a lot of resources from everyone being a part of these processes. A consequence of these workarounds is that users do not get the right information needed.

Many studies have already been conducted at the DoS level at UU. However, none explicitly mapping out the head activities of a DoS. Untangling and unraveling the seemingly endless amount of undocumented activities of a DoS has proved itself convoluted.
Boiling down the decision making activities of a DoS showed that there are several activities that are heavily reliant on systems, other activities on the aid of people, and some solely on the expertise of the DoS. Enabling the access and manipulation of data is therefore of great importance.

Gaps have been found on the activities carried out by a DoS where the BI concept adopted by this study of getting the right information to the right people at the right time is not being satisfied.

Some suggestions of improvement to assist in resolving this problem are presented below. Each one is presented with a detail description follow by a figure that shows which part of the budgeting and planning cycle mentioned in chapter 3 would be affected. In the end, the whole cycle including all the improvements proposed is shown.

5.2 Improvements

Firstly, regarding budgeting at the DoS level, there is an evident shortcomings regarding system functionality that would support DoS level decision making. A missing feature is for example being able to simulate what could happen next year with the budget of a course. Taking into account previous course budgets and other factors that may fluctuate over the years.

![Figure 5.1: Course budgeting (DoS) suggestion of improvement](image)
Moreover, a system feature could be implemented to automatize the DoS planning level activity, where the head teacher and potential teachers are being selected. This will lead to a fluent execution of the process and will aid in keeping track of it. The need of emails and meetings will be nullified through this solution and it will also solve some of the problems concerning to the use of unstructured data.

Lastly, going deeper to the head teacher planning level; one of the departments actually has a planning system called PM as described before in chapter 3. The Activity Planning System (a prototype system) could be an optimal solution for this. We propose that this system should be integrated with the PM system in order to cover the lacking features, or even completely replace it since the Activity Planning System already covers the PM features.
There are several systems in place that claim to be using rigorous statistics when presenting some of the information used when planning the annual budget, GLIS being one of these. However, there has not been any research proving the rigor of the sources used in this system. We propose that there should be a feature in the future system that tasks itself with solving this issue, using accurate and exhaustive sources.
Next in figure 5.4, the activities cycle seen before is presented highlighting the spots where the improvements suggested matches:

![Budgeting and planning cycle with improvements](image)

**Figure 5.4: Budgeting and planning cycle with improvements**
5.3 Further Research

We would like to propose that any further research that builds on this thesis aims to cover some of the background information needed in order to pursue a better system. This thesis has accomplished to map out the head activities on a DoS level. However, there are still more sub-routines and activities not mentioned here that might be of interest to investigate.

There is also a considerable need to further investigate some of the implemented systems. We acknowledge that several inventories have been done in order to map out the infrastructure. However, there is insufficient research regarding information objects flowing from the systems and the validity of the sources used.

To be more specific, research is needed to (1) Explicitly cover the system used on DoS and teacher level, (2) Define information object flows between interactor and systems and, (3) Evaluate these and the sources in order to create better architecture of data structures and database handling.

5.4 Concluding remarks

We believe that producing a system to replace the current complications cannot be done in the present day. We maintain that the proposed further researches are essential before developing a system to replace the current infrastructure.

The reason for this is that there are several factors, that we consider as vital, which are yet unknown or not explicitly discussed. Examples of these are:

- The flow of information objects between systems and actors.
- The structure of the databases.
- A complete and accurate inventory of used tools and systems.
- Verification of sources, such as the ones used in GLIS.
- Additional mapping of organisational head activity. For instance, the head activities of users in contact with systems other than DoS’s.

In concrete, we believe there is a clear need for a system which can remedy some of the discussed issues. The problem area is however currently too immature and unknown to realize or implement any new infrastructure or feature in any of the current systems.

We consider the Activity Planning System as a valuable feature for a future system. However, we urge future development to be halted. As well as for developers to not focus extensively on the prospective future without paying adequate attention to the present, inadvertently taking premature action without a sufficient base of knowledge.

The main goal for future development should rather be aim to architecture adequate and structured routines for key positions in UU, such as for DoS’s and Head Teachers.
References


## Appendix A

In the following table, interview questions of the two different sets are presented.

<table>
<thead>
<tr>
<th>Unstructured Interview Questions</th>
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<tbody>
<tr>
<td>1. What can you tell us about the current BI implementation of the Uppsala University?</td>
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<tr>
<td>2. Is there any issue that you have identified regarding the use of the IT systems of the Uppsala University?</td>
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<tr>
<th>Semi Unstructured Interview Questions</th>
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<tbody>
<tr>
<td>1. Which are your main responsibilities?</td>
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<td>2. Which are your main activities?</td>
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<td>3. Do you use any IT system to support your daily tasks? Are these adequate?</td>
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<td>4. Do you receive support from other persons to accomplish your tasks?</td>
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<td>5. Have you identified any issue that hinders your work?</td>
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