Universiteit Leiden

ICT in Business

Improving the creation of innovative IT solutions within Dutch universities – Via a soft IT perspective

Name: W.L.C. Koeldiep

Student-no: S1289195

Date: 16/06/2014

1st supervisor: R.T. Hewins MBA/MBI
2nd supervisor: Dr. H.T. le Fever

MASTER'S THESIS

Leiden Institute of Advanced Computer Science (LIACS)
Leiden University
Niels Bohrweg 1
2333 CA Leiden
The Netherlands

Improving the creation of innovative IT solutions within Dutch universities

– *Via a soft IT perspective*

Zoetermeer, June 2014

Author
W.L.C. Koeldiep
Program ICT in Business
Leiden Institute of Advanced Computer Sciences
Student number S1289195
E-mail koeldiep_w89@hotmail.com

Graduation committee

R.T. Hewins MBA/MBI
Department Leiden University, ICT in Business

Dr. H. le Fever
Department Leiden University, ICT in Business

Company

Msc. Bram Lankreijer
Department KPN Consulting, Government & Education
Bram.Lankrijer@kpn.com

Msc. Ahmad el-Husseini
Department KPN Consulting, Government & Education
Ahmad.Ahmad@kpn.com

Abstract

The Dutch government aims to improve the quality, accessibility and efficiency of the Dutch education (Rijksoverheid, 2011) through continuous investments. The Dutch government stimulates the universities to improve their educational programmes via adoption of innovative technologies. A simple example of an innovative technology is a *Massive Online Open Course* (*MOOC)*: Offering (free) digital educational courses worldwide, without limiting students with physical distances. To find out how the application of innovative IT solutions in education is perceived currently, informal information was gathered within a faculty of a Dutch university. The students stated they barely noticed any impact of innovation in their education and innovative IT solutions remained barely unused or were unavailable.

Improving the creation of innovative IT solutions, could enable universities to offer more state-of-the-art, feasible and usable solutions to teachers and students. This could enhance and improve the performances and experiences within teaching and learning. This research aims to develop an understanding whether the creation of innovative IT solutions can be stimulated with insights from Information Management concepts, such as IT governance and Business and IT Alignment (BITA). More specifically, the Strategic Alignment Maturity Model (SAMM) and the Amsterdam Information Model (AIM) are used to gather relevant data for this research. Dutch public universities cannot be compared to average businesses. Due to their complex organizational and financial structures, they operate differently. The existing complex organizations influence the applicability of Information Management and BITA frameworks.

The following research questions have been addressed:

RQ 1: Is there an organizational structure on the basis of the AIM framework that would allow Dutch universities to improve the creation of innovative IT solutions for use by students and teachers in the education process?

RQ 2: How can the process of creating innovative IT solutions within Dutch universities be improved?

RQ 3: To what extent do Luftman's strategic alignment criteria contribute to the delivery of innovative IT solutions for education in a situation without any constraints?

To answer the research questions, a comprehensive literature review has been conducted to find supporting theories for substantiating findings. The resulting theoretical framework was followed by the comparison of new theoretical models, with regards to Information Management concepts, with the practice of three Dutch public universities. The comparisons are supported by a preliminary investigation via 24 semi-structured interviews with IT staff members, students and teachers of the three Dutch universities. During the investigation, 14 interviewees were asked to draw organizational diagrams within the AIM framework. Lastly, IT staff members of the three investigated Dutch universities filled in questionnaires, based on

the SAMM. This was aimed on finding important BITA criteria to complement the research findings.

The initial conclusions of this research are:

- No ideal organizational structure for Dutch universities has been found that allows the improvement of the creation of innovative IT solutions;
- The demand, demand management and the supplying parties for innovative IT solutions could be depicted within the AIM framework;
- A list of 11 proposals for improving the creation of innovative IT solutions within Dutch universities is created;
- Within the researched Dutch universities, the principles and functions of Information Management and Demand Management are similar and have the same meaning;
- There is a relationship between the 11 improvement proposals and the creation of BITA. The relationship implies that via improving BITA, the creation of innovative IT solutions could also be improved and vice versa;
- Not all Luftman's criteria for BITA are fully applicable within Dutch universities for improving the process of creating innovative IT solutions, which limits the usefulness of the SAMM to a certain extent.

To validate the initial conclusions of this research, further research is required on tactical and strategic levels of more Dutch universities.

Table of contents

Abstract 3
Acknowledgement 7

PART 1 – INTRODUCTION 8
1. Problem definition 9
2. Research approach 11
2.1. Research goal 11
2.2. Research questions 12
2.3. Research scope 13
2.4. Research guideline 15
2.5. Relevance 18

PART 2: THEORETICAL BACKGROUND AND THEORIES 20
3. Introduction to Dutch universities and the creation of innovative IT solutions 21
3.1. Important business functions of Dutch universities 21
3.2. Innovative IT within universities 23
4. Related theories 26
4.1. IT Governance 27
4.2. The Amsterdam Information Model 28
4.3. Business and IT Alignment 32

PART 3: EMPIRICAL PROOF AND RESEARCH RESULTS 38
5. Methods and instrumentation for research and analysis 39
5.1. Literature review 39
5.2. Interviews 40
5.3. Surveys 47
6. Empirical proof 51
6.1. Main observations 51
6.2. RQ 1: The ideal organizational structure 52
6.3. RQ 2: General improvement proposals 60
6.4. RQ 3: Contribution of BITA to creating innovative IT solutions 64

PART 4: CONCLUSIONS, REFLECTIONS AND RECOMMENDATIONS 69
7. Conclusions 70
7.1. The ideal organizational structure 70
7.2. General improvement proposals 71
7.3. Contribution of BITA 72
7.4. Recap 72
8. Discussion, limitations and opportunities for further research 74
8.1. Discussion per RQ 74
8.2. Limitations 75
8.3. Suggestions for future work 77
9. Literature 78
Glossary 83

PART 5: APPENDICES 85
Appendix A 86
A.1. List of abbreviations 86
A.2. Explanation of the AIM 86
A.3. Results of statements of Research Question 3 88

Acknowledgement

One year ago, my classmate dragged me to a 'company diner' for students and recruiters for companies. I did not want go there, but my classmate was able to convince me. I met a nice lady there who was a recruiter for KPN Consulting. Due to personal reasons I did not want to work for KPN Consulting, resulting in not giving too much attention to her and the company. Two to three months later she approached me with the offer to find me a spot to conduct my thesis. After hesitating a long time, I accepted her offer and I came in contact with Daan Linden. Daan Linden (then a manager for a consulting group, now the director of all consulting groups) brought up some interesting topics and it was on me to decide what I would do. Now, almost a year later, I do not regret this choice for a second. It was the best choice I made in 2013.

I would like to express my very great appreciation to Bram Lankreijer and Ahmad Elhusseini. Both supported me with great guidance. I would like to compliment them for the way they motivated me and challenged me to think differently. In addition, I appreciate their critical notes a lot. I would like to express my gratitude to Robert Hewins, my research supervisor, for his excellent guidance. Even though he was not involved with this research from the beginning, he did a very good job in pulling me through the last miles. I must also compliment Robert for his patience and his ability to provide well founded feedback. Via a colleague I got in touch with Hans Nouwens (from the Delft University of Technology). I wish to acknowledge Hans for the inspiration he gave me to investigate the topic of this research and for all other insights. I would also like to thank Hans le Fever, the second reader of this thesis, for his guidance in the first months of my research. I would like to offer my special thanks to Daan Linden for giving me the chance to conduct my research at KPN Consulting. I would also like to extend my thanks to my colleague-consultants of ex-dept. Government & Education for helping me with finding the right resources for my research.

Finally, I wish to thank my mother for her great support and encouragement throughout my whole life, especially when it came to education. In the last two years I have been greatly supported by Bar, who I also wish to acknowledge for his caring. I would also like to thank Joey Roetman for all inspiration he gave me to continue with this research. At last, but not least, I want to acknowledge my beloved father, who passed away in june 2009. I hope that I can make him proud.

If you understand how a man learns and what effective learning methods are available, please enable education with some exciting technology!

June, 2014.

Warsha L.C. Koeldiep

PART 1 – INTRODUCTION

This section gives a definition of the reason for conducting this research. This definition will create insights in the usage and the experience of innovative IT solutions within the education in Dutch universities. Thereafter, a description of the research approach is given to create understanding in how this research is conducted and with what resources.

Table of contents:

1. Problem definition 9
2. Research approach 11
   - 2.1. Research goal 11
   - 2.2. Research questions 12
   - 2.3. Research scope 13
   - 2.4. Research guideline 15
     - 2.4.1. Research approach 15
     - 2.4.2. Research instruments 17
   - 2.5. Relevance 18

1. Problem definition

Information Technology (IT) became an important enabler for business operations. IT helps the business with 'enabling new strategies to create mass customization, competitive differentiation, quality improvements and process automation and improvements' (Bruce, 1998, p.16). Due to the growth of the utilization of technology, our life changes drastically. This is also visible within education, wherein IT has got a major impact in how we learn.

In recent years there has been an increasing interest in innovation within education. The intention of the Dutch government is to improve the Dutch education by means of innovation. The Dutch government has created a bill that aims for further improvement of the quality of all kinds of education (press release Dutch government, 2011). The Dutch government continuously invests in education to create a large group of skilled, qualified and educated workers that will make a contribution to the future economy (Rijksoverheid, 2013). To achieve this, more space has got to be created for structural innovation to improve the accessibility and efficiency of education.

Innovation is one of the aspects where educational institutes focus on when it comes to the improvement of the innovativeness of IT solutions within education. Innovative IT solutions in education could support the students and teachers with their most important activities: Giving and attending education. The solutions could ease the process of teaching and/or learning, leading to better results for both students and teachers.

However, students of the LIACS (the Leiden Institute of Advanced Computer Sciences, a department of Leiden University) indicated that they barely notice the impact of available IT solutions on their education. In addition, they indicated that they did not experience innovative education via current deployed IT solutions. As an example of an innovative IT solution elsewhere they quote 'Lecturenet' (University Utrecht, 2013), deployed on the university of Utrecht. Lecturenet is a service that records lectures, symposia and conferences by recording audio-visual presentations simultaneously. One observer has already drawn attention to the paradox of the availability of innovative IT solutions/services like Lecturenet, (or any similar innovative IT solutions) and continuing with the current way of teaching and learning. Some other faculties within the Leiden University do have similar solutions like 'Lecturenet, but they are not available to students in LIACS.

Furthermore, within the LIACS the level of interactive teaching is experienced as low. Development end provision of IT services is based on a variety of considerations and choices, affirming that there could always be a specific reason why the LIACS environment is lagging in providing innovative educational IT solutions. Besides the fact that the LIACS of Leiden University copes with this problem, the assumption was made that other Dutch universities might also cope with problems that make it hard to innovate their education by using innovative IT solutions.

The exact reason behind the lacking and/or slower innovation of IT solutions is not yet known, which was the decisive factor to conduct this research in a few selected instances of Dutch universities. In particular business and IT alignment (BITA) and Governance frameworks (the Amsterdam Information Model, i.e. the AIM) have been considered to find potential contributors to the issue and to identify ways to stimulate the process.

2. Research approach

This chapter will create insights into the research approach. The research approach is very important, due to the fact that it helps stating with what resources and how this research will be conducted and what the scope and relevance of this study is.

At first is the research goal described in the first paragraph of this chapter. The second paragraph (2.2.) is concerned with the research questions. Then the scope of this research is presented in paragraph 3 to indicate until what range this research will be limited. In the fourth paragraph (2.4.), the research guideline is presented. The research guideline presents the research approach including its research instruments. At last, in paragraph 5, the relevance of this research is presented for insights into the knowledge that could be created.

2.1. Research goal

Recent developments within technology have increased the need for a technology driven change within education. So far, however, there has been little discussion about how Dutch universities could improve the innovation of their IT solutions via its organizational structure and via the creation of business and IT alignment. This study aims to develop an understanding *whether there is an organizational structure (according to the AIM), capable to stimulate the creation of innovative IT solutions within Dutch educational institutes*. The second purpose of this research is to find out *how the process of the creation of innovative IT solutions can be improved.* The last purpose is *what BITA criteria are used to which extent to align the business and IT.* The end objective is to stimulate Dutch universities to improve their capabilities to create innovative IT solutions.

This research attempts to obtain the following findings:

- A depiction of how the ideal organizational structure for universities looks like within the AIM, in case the universities want to improve their processes of creating innovative IT solution;
- Insights in how the creation of innovative IT solutions could be improved by means of the business processes of the Dutch universities;
- A list of criteria that can be used to support and eventually improve the alignment between the IT department(s) and the educational business (students and teachers) of the Dutch universities.

By means of this information, a contribution will be made to the existing knowledge on creating innovative IT solutions via business and IT alignment, supporting organizational structures and weaknesses within Dutch universities.

2.2. Research questions

This study is aimed to address the following research questions:

RQ 1: Is there an organizational structure on the basis of the AIM framework that would allow Dutch universities to improve the creation of innovative IT solutions for use by students and teachers in the education process?

Sub question 1.1.

Part 1 - If yes: Which organizational structure with regards to the AIM framework, ideally allows Dutch universities to improve the creation of innovative IT solutions for the use of students and teachers give and take education?

Part 2 - If no: What are the reasons for the inability to draw an organizational structure with regards to the AIM framework that ideally allows Dutch universities to improve the creation of innovative IT solutions for students and teachers to give and take education?

Sub question 1.2.

Is there, according to the IT staff members of Dutch universities, a specific structure with regards to the AIM framework that depicts the demand of innovative IT solutions, the supply of innovative IT solutions and a component that 'collects' or 'gathers' the demand and then translates it to a solution, which can be executed by the supply organization?

The outcome of the first research question aims to reach to an AIM which presents the following: An ideal situation within a Dutch university that indicates which people and/or departments have a stake in the creation of innovative IT solutions for educative purposes. The expected outcomes are a result of interviews with IT staff members from three universities. The AIM provides a better picture of how an IT-department (or other related entities) would establish their IT solutions and services. Furthermore, the second sub question will find out if another structure can be depicted to see if the involved people/departments can be generalized.

The improvement of the organizational structure could be a way to ameliorate the process of creating innovative IT solutions. In case the ideal organizational structure cannot be drawn, the reasons for this inability will be given.

RQ 2: How can the process of creating innovative IT solutions within Dutch universities be improved?

RQ 2 will give insight in how the processes of creating innovative IT solutions can be improved within the Dutch universities: The results will be based on what goes wrong concerning the creation of innovative IT solutions. Furthermore, the results will be based on personal experiences of IT staff members and students and teachers (the educational business) of the researched Dutch universities. The given suggestions for improvement are not based on the organizational structure, but on the current situation within the organization, which could be directly affiliated with internal (and eventually external) influences and events within the organization.

Various processes lead to the creation of innovative IT solutions and all bring forth their own complexity. RQ 2 concentrates on which processes occur the most within a university.

RQ 3: To what extent do Luftman's strategic alignment criteria contribute to the delivery of innovative IT solutions for education in a situation without any constraints?

RQ 3 gives insights into how the IT departments of Dutch universities can deliver a contribution to innovative IT solutions via strategic alignment. The given alignment criteria will be presented as 'enablers' of BITA (Luftman, 1999; 2000; 2007), listed as 'interventions' to conduct BITA. The results of RQ 3 will give insights in what BITA criteria and to which extent these should be taken in account by Dutch universities to improve their strategic alignment, in case more innovative IT solutions have to be created.

2.3. Research scope

It is beyond the scope of this study to examine all Dutch universities and its entities. The following limitations are set to limit the target group:

- Minimal 2 to maximum 5 Dutch public universities will be investigated;
- Universities have specific organizational structures. Symons et al. (2005) stated that there are project-based, federated, decentralized and centralized IT structures (see chapter 4.1. for more information):
    - In case of a decentralized/federated instance, the IT departments are organized per faculty. Therefore at least two faculties with an IT provision will be considered for this research. The faculties have to be a social studies faculty or a technical science faculty, due to the fact that the organization of the IT could be different per field of study;

- The focus of this research is on the core educational processes, which are 'taking and giving education'. Processes that support the education (HR, administration, libraries) and research related processes will be left out of the scope;
- Per IT department, people of strategic and tactical level, and eventually operational level, will be interviewed to create a broad vision on the AS-IS and future situation of the university's IT department and solutions;
- From the educational business (see explanation below table 1), teachers and students with predominantly managing roles will be interviewed:

The following table presents which parties could be interviewed:

Table 1: Possible target groups for interviews

Demand for innovative IT solutions (Business)	Supply of innovative IT solutions (Information Communication and Technology)
Students	Head IT/IT Manager/CIO
Teachers	Service level managers/Quality managers/ Information Managers/ICT and Education Managers
	Business and IT demand managers/workers
	Other IT support workers on (de)central level

Whenever BITA is created, not only the IT department of an organization has got to be investigated, but also the business. In terms of business and IT, the business is mostly seen as an entity that performs business processes to create services and/or products. The services and/or products are delivered in order to generate profit for an organization. During their activities, the business utilizes services, tools and products that are delivered by an IT entity.

In case of educational purposes, it is hard to speak about a business that generates profit, because the public universities in The Netherlands are non-profit. The profitability of a Dutch public university is measured within terms of how many students graduate/promote per year. In terms of this research, the business within the Dutch universities will be described as 'the educational business'. The educational business covers the section of a university that use or provide the services for *education*[2], covering students and teachers. The interviewees of the educational business should be responsible for giving education or taking education and the utilization of IT services.

[2] Dutch universities deliver a lot of services. Two very important services are the delivery of education and the support for research. The focus of this research is on the delivery of education.

2.4. Research guideline

The research approach, as described in chapter 2.4.1., is grounded theory in combination with the usage of a quantitative research approach. The combination of both approaches covers the multimethodology approach: Broadening the research scope and range of information (Cresswell, 2004). In chapter 2.4.2. the research instruments will be described: Literature review, interviews and surveys.

2.4.1. Research approach

The first and the second research questions will be underpinned with a Grounded Theory (GT) 'approach'. This is a form of qualitative research wherein the theory is constructed via iterative phases within the data construction and data analysis (Boeije, 2005; Glaser & Corbin, 1990). The GT approach has got the following two characteristics (Kwamcowiki, 2010):

- Inductive, meaning that the theory is formed based on collected data
- Iterative: The data collection and analysis are a continuously repeated process.

Grounded theory methods consists of systematic, yet flexible guidelines for collecting and analysing qualitative data to construct theories 'grounded' in the data themselves (Charmaz, 2006). According to Birks and Mills (2011), GT is mostly obtained from qualitative research methods, like interviews (Corbin & Strauss, 1990).

The GT approach is a solution in case there is a little to no amount of literature starting material (Lehmann, Myers & Urquhart, 2010; Corbin & Strauss, 1990). Scientific literature about the current IT structures within Dutch universities with regard to the AIM-framework is virtually absent, resulting in the need to conduct this research without any underlying theory. Another reason for the choice for GT is that the approach offers the opportunity to explore the situation and analyse new information for this research.

To answer the third research question, a survey will be used. This is an element of the quantitative research approach.

The combination of both approaches results in the **multimethodology approach.** Multimethodology is a research approach wherein qualitative and quantitative data are combined and analysed (Cresswell, 2004). The choice for the approach is based on the fact that the application of different methods add more scope to the study and broadens the research field, resulting in an 'expansion' of data. Furthermore, it is underpinned by the principle of 'triangulation': The usage of more than one research method to conduct the research (Bryman, 2012; Mingers & Brocklesby, 1997), which will be reached by using a qualitative methods (unstructured and semi-structured interviews, drawing and literature review) and a quantitative method (surveys). Multimethodology is used to focus attention on different paradigms in a specific situation to be able to deal better with complex problems

(Mingers & Brocklesby, 1997). In this case the approach will be used to discover the unknown.

Figure 1 presents the research approach, elaborated in a structure and presenting the steps within the whole research process. The research will be done within four phases (initiation phase, data collection phase, data analysis phase and the theoretical interpretation of the results) which are defined via the dashed lines in the figure. The squares present the main actions that will be done to conduct the research properly.

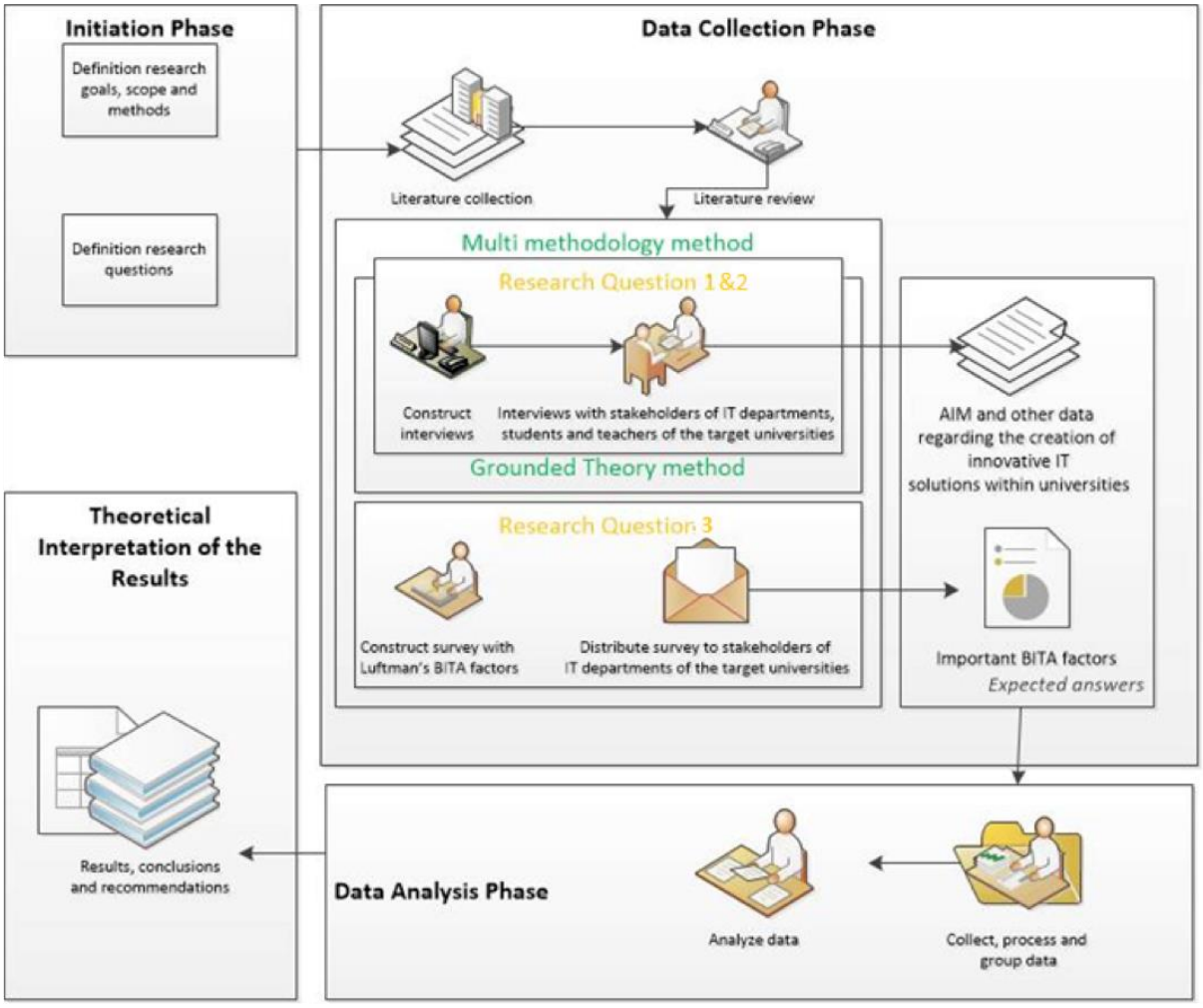


Figure 1: Research approach 1

The approach is partially based on elements of the Prince 2 project management methodology (Van Onna & Konings, 2010). The initiation phase has been established based on the methodology. The resulting product from this phase was a research plan, preceding this research. In addition, the participants of this research will get to opportunity to provide feedback which will be used in Prince 2 quality management tools (Lessons Learned Report).

2.4.2. Research instruments

Literature review

A research within existing academic literature will be conducted to obtain relevant input which are related to theories of the application of IT within educational institutes, business and IT alignment, innovation, Luftman's SAMM (Luftman 1999; 2000; 2007) and the Maes' AIM-framework (Abcouwer, Maes & Truijens, 1997; Maes, 1999; 2003; 2007). The relevant literature will create a theoretical framework of information that can be applied within the research. Another reason to conduct the literature review is in view of underpinning the findings of the research with academic literature.

Interviews with stakeholders of the IT departments and the educational business of universities

The interviews are aimed at getting information for answering RQ 1 via its sub questions and RQ 2. The interviews with both the IT staff members and the educational business will be semi-structured.

IT staff members of different universities will be interviewed first. They get the opportunity to draw within the AIM, due to the assumption that their knowledge about organizational and IT structures, IT staff members and IT processes are sufficient. Secondly, the students and teachers will be interviewed to identify the grounds of what is blocking the creation of innovative IT solutions or why the current grounds of creating innovative IT solutions are sufficient.

An explanation about the interviews will be given in chapter 5.2. The conversation details can be found in Appendix E.

Drawing

The AIM (see for more information chapter 4.2.) will be used to sketch the current and ideal situation(s) of the information provision within a university. These information provision streams are important to map how innovative IT solutions for education are realized. The drawings will be used as raw data, that will be processed afterwards into various AIM frameworks that demonstrate what the ideal organizational structure is that allows for innovative IT solutions. The advantage of the drawing method is it supports interviewees by visualizing situations, which stimulates conversations. The might result in more explanation about details of the interviewees after illustrating the situation, which is beneficial for obtaining more information for this research.

There was an uncertainty about the functioning of this method due to the fact that the AIM, as far it could be determined, has never been used as a framework within academic research.

This insecurity has been disproved with two test interviews. Chapter 5.2.4. will give more insights in this method.

Questionnaires

Questionnaires, which are based on Luftman's SAMM (see chapter 4.3.5.), will be used as a quantitative research methodology to collect data about the measures of BITA within a Dutch university. All interviewees from the IT departments of the researched Dutch universities will be requested to fill in the questionnaires. In addition, direct business circles will be requested to forward the surveys to IT staff members of the selected public universities. Chapter 5.3. will give more insight in this method.

2.5. Relevance

There are various grounds for conducting this research. Below in this paragraph is explained on what grounds this research has got relevance and why.

Academic relevance

The results of this research will deepen the existing knowledge of academics about important BITA criteria and the understanding of IT organizations within (Dutch) universities. Secondly, the subjects of research could also be relevant for academic teaching. The results could be used to give new insights into BITA (in case there are new insights into the SAMM) and the AIM, which deepens the knowledge of both subjects and could lead to new researches.

Relevance to Dutch universities

At first, the results of this research will give the universities insights into existing weaknesses related to the creation of innovative IT solutions, within the IT and/or educational organizations. Awareness over these weaknesses could help the universities with finding solutions to improve the situation. Next, the end results of this research provide universities a tool that gives insight in the relationship is between the business and the IT department. For the universities it could be useful to improve the areas that are not organized optimally, by using the data of this research. The important BITA criteria can be taken in account when a university wants to align its IT with the business and the other way around. The usage of and the focus on these BITA criteria, in combination with the right organizational structure, could make the process of alignment and the creation of innovative IT solutions more efficient.

Other relevance

The results can be used in advising Dutch universities on IT (related) matters. Whenever the IT departments of universities are able to manage a balance between the criteria of the new SAMM in combination with another company structure, there might be a chance that the IT services and products to the service recipients (like students and teachers) will improve. IT solutions that support the service recipients, might lead to a better performance, which indirectly lead to better study experiences, higher academic results, an improved work environment and of course a better working experience.

PART 2: THEORETICAL BACKGROUND AND THEORIES

This part presents the theoretical foundation of this research by explaining all theoretical backgrounds, terminologies, frameworks and models. The highlights per theory will be elaborated from an abstract subject to the application of the theory within the context of this research. Moreover, there will also be a focus on how Dutch universities operate.

Table of contents:

PART 2: THEORETICAL BACKGROUND AND THEORIES 20
3. Introduction to Dutch universities and the creation of innovative IT solutions 21
3.1. Important business functions of Dutch universities 21
3.1.1. Important entities 21
3.1.2. Important processes within the Dutch universities 22
3.2. Innovative IT within universities 23
3.2.1. Definition of innovation 23
3.2.2. Making innovative IT solutions a success 24
4. Related theories 26
4.1. IT Governance 27
4.2. The Amsterdam Information Model 28
4.2.1. Information Management 28
4.2.2. The Amsterdam Information Model 29
4.2.3. Application of the AIM 30
4.3. Business and IT Alignment 32
4.3.1. What is business and IT alignment? 32
4.3.2. Why do BITA? 33
4.3.3. What is the problem with creating BITA? 34
4.3.4. Application of business and IT alignment in Dutch universities 35
4.3.5. The Strategic Alignment Maturity Model 35

3. Introduction to Dutch universities and the creation of innovative IT solutions

This chapter presents important information concerning Dutch universities and innovation within education. In the first paragraph (3.1) the important business functions of Dutch universities are described, including its important entities and business processes. The second paragraph (3.2) gives the definition of innovation: This term is a commonly used and has a broad definition. Attention will be paid to the application of this term within education, in relation to the usage of IT solutions.

3.1. Important business functions of Dutch universities

A Dutch public university is funded by the Dutch government. The Dutch Ministry of Education, Culture and Science maintains the (lower, middle, and higher) education portfolio. The ministry stated that the quality of the higher education should be improved (Rijksoverheid, 2013), for which measures are taken. An important measure that impacts this research is obliging universities to improve their education via innovation. The government funding creates the preconditions for scientific education, research and work of universities in terms of knowledge valorization. Private resources can be recruited through particular teaching contracts and researches (VSNU). Every university addresses the recruitment of private resources on their own manner.

3.1.1. Important entities

Dutch public universities do not operate like average organizations. The main goal of a Dutch public university is to continue by letting their students promote/graduate, instead of making profit. Where average organizations have a clear distinction between IT and business, the business within a university is hard to depict. The main product that a university delivers is education. IT services and products are delivered to students and teachers to enable them to produce/use educational products. The merging of both groups as utilizers of IT services makes this group not a 'business', because none of both will not generate profit. This research will speak about 'an educational business' which utilizes IT services.

Dutch universities are mostly complex organizations, from which each university has got its own organizational structure.

- The external parties that influence the process of creating innovative IT solutions are mostly the Dutch government, the SURF partnership[3], Dutch universities reciprocal and external companies (for funding or delivery/supply of IT solutions/services);

[3] SURF is a collaboration of stakeholders of Dutch higher educational institutions for IT innovation

- Internal parties who can influence the process of creating innovative IT solutions of Dutch universities are the University Board, Education Councils, Student/Teacher/Faculty Councils, individuals (often teachers/professors), etc.

Within universities it is hard to designate one specific customer, due to the fact that there are a lot of customers that make use of the provided services. For this research, **the students and teachers** are the most important customers of Dutch universities when it comes to the usage of innovative IT solutions for taking and giving education.

3.1.2. Important processes within the Dutch universities

The SURF partnership has created the HORA: The Higher Education Reference Architecture. The HORA is a collection of instruments that is used for designing the organization and Information Management of the Dutch higher educational institutes (SURF, 2013). According to the HORA's business function models, Dutch higher education institutes mostly concern themselves with the following processes (SURF, 2013):

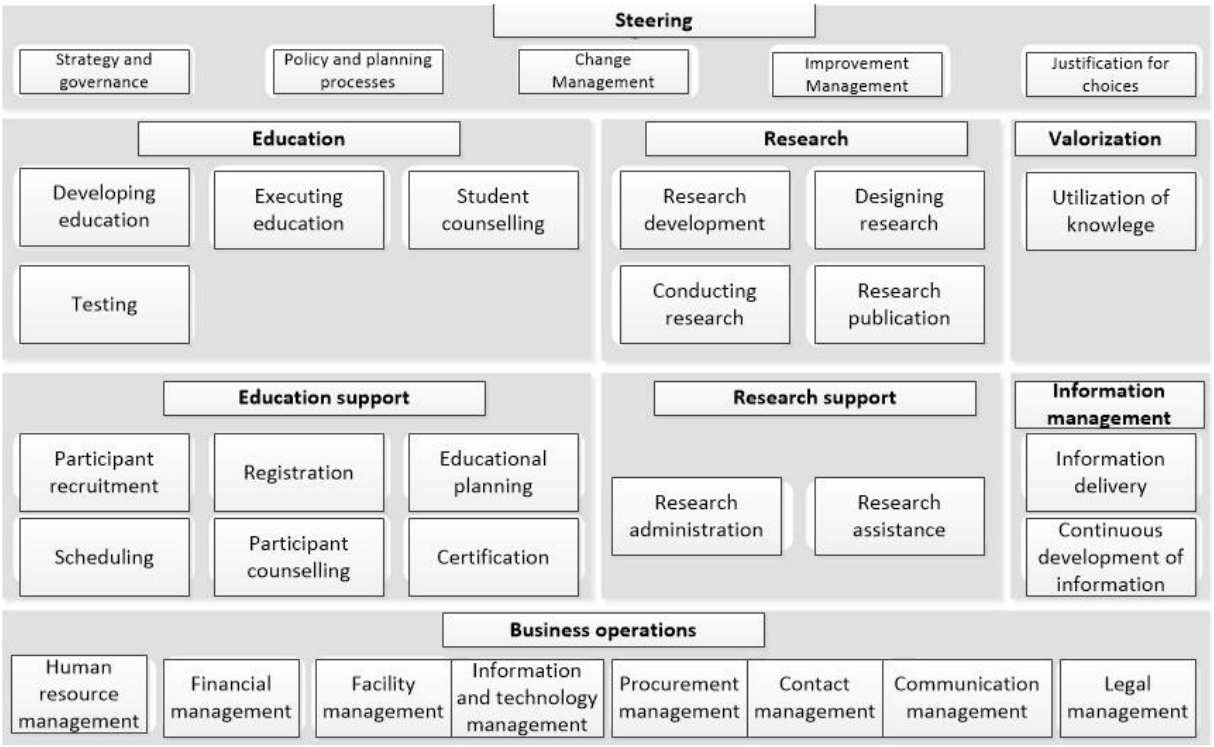


Figure 1: Business processes Dutch higher education

The focus within this research is on **'education'** and **'education support'**. Without both primary business processes, education cannot be given or taken. The other processes, are given in figure 2, are needed to conduct research, to create information, to create knowledge valorization, to run the business operations that supports research and education and to support steering within the universities.

3.2. Innovative IT within universities

IT solutions are continuously subjected to innovation, which is a form of change. This chapter will elaborate what innovation is, how it is applied within education and what the definition of innovation is within this research.

3.2.1. Definition of innovation

The Oxford dictionary defines innovation as an 'action or process which is crucial to the continuing success of any organization' and as 'a new method, idea, product, etc.' based on the first definition.

Another definition is that innovation is a process of creating a service, process, or product (as a solution) which delivers specific customer value, knowledge, of improvement on the way we live (Ulwick, 2005; Leonard & Swap, 1999). Schumpeter (1934) describes the process of continuous innovation as 'creative destruction': New technological innovation destroy older ones, resulting in a 'source' of economic growth.

Christensen et al. (2008) described the phenomenon disruptive innovation as: "Making it possible for simple, affordable and accessible products to replace complex, expensive and inaccessible products". A good example is the Toyota that replaces a Rolls Royce car: The Toyota can also drive, but for far less money. Christensen et al. stated in his research that disruptive innovation within the education system will lead to changes that deviates from standardization (causing more customization of the education) resulting in better results for the students. The customization can be done on various ways. One of them is the usage of information technology within education. Information technology captures innovative concepts for learning or the organization of learning.

Innovation can be found in anything: This research has got a focus on innovation of information technology (IT), from which the focal point is on *delivering and receiving education via innovative IT solutions.* An innovative IT solution could be defined **as a new (the creative destruction of old tools), original and/or improved (disruptive innovation) technological solution that creates value for the students and teachers within Dutch universities.** The choice for a specific innovative IT solution could be based on a technological trend and can be driven by the IT organization, the business (students, teachers and other employees of universities) and external sources. An example of an innovative technological solution is the application of free MOOCS (Massive Online Open Courses)[4] which makes a course globally available.

[4] MOOCS are innovative because it is a new concept within the educational world that is deployed to attract new students, while at the same time it partially destructs the process of promoting courses and programmes of universities abroad. It is also a new and improved method of learning: A student of any country can participate on an Open Course via the internet, without going abroad.

What does the innovative IT solutions mean for the Dutch academic education? The goal of the usage of innovative IT solutions within a university is **improving the education**.

3.2.2. Making innovative IT solutions a success

In case of creating an innovative IT solution for educational purposes, it is important that the solution will be applied in practice. To make innovative IT solutions interesting enough to be applied, it is important to take important factors in account that influence the usage of innovative IT solutions.

An interesting model for the usage of IT solutions in education is the TPACK (figure 3). Koehler and Mishra (2005; 2009) created the model, which treats the approach of teaching as an interaction between the teacher's knowledge, the method of applying this knowledge and the context/situation within their classroom and courses. Koehler and Mishra (2005; 2009) concluded that teaching with technology is a combination between the insights of the teacher: Content Knowledge (CK), pedagogical knowledge (PK), technological knowledge (PK) and the relationship between these three factors.

CK is the knowledge of the teacher about the subject that has to be taught to and learned by the students. PK is the knowledge of the teacher that covers the processes, practices and/or methods of teaching and learning. TK is the manner how information technology is used to accomplish and develop different tasks concerning teaching and learning.

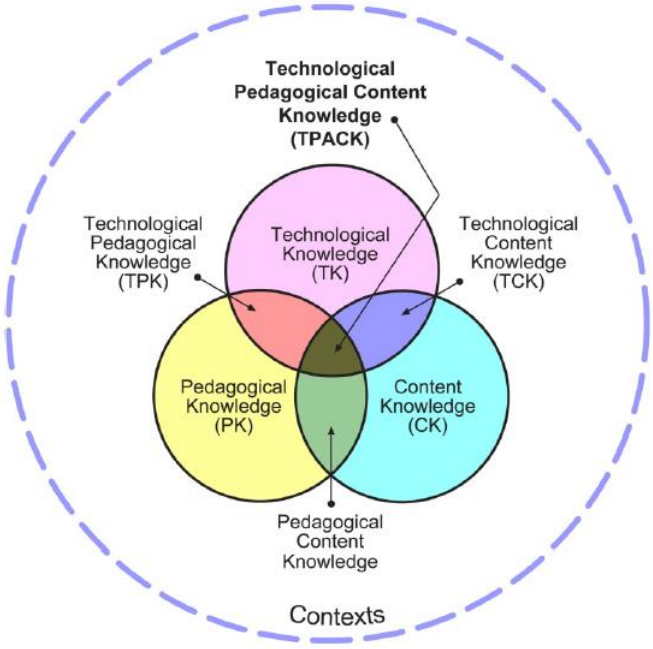


Figure 2: The TPACK-model (Koehler and Mishra, 2009, p.17)

As you can see in figure 3, the three principles of knowledge overlap one another: This is when TPACK is reached.

Reaching TPACK results in the following:

"TPACK is the basis of effective teaching with technology, requiring an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge to deep new epistemologies or strengthen old ones". (Koehler & Mishra, 2009, p.66.).

Brouwer, Dekker and Van Der Pol (2013) stated that in the TPACK, thus the combination of the three knowledge components, innovation within teaching can be reached. From the perspective of this research, it could be stated that this is also an important method of making innovation a success in education.

4. Related theories

The main purpose of this chapter is to develop an understanding of the topics 'Information Management', 'IT Governance' and 'Business and IT Alignment'.All four subjects are fully IT related, but do not deal with any detailed and complex technological aspects of IT. The subjects that are treated within this research are all characterized by business management aspects, also called the '*soft*' IT perspective.

The creation of innovative IT solutions depends on three factors that influence the process:

- *The management of information:* How should existing and future information be used and/or processed to create innovative IT solutions?
- *The governance of the IT*: How and by who are the decisions made for the innovative IT solutions?
- *The alignment between the business and IT*: How can we create a fit between the business (education) and the IT department within universities to improve the process of creating more innovative IT solutions?

All three subjects are related to each other via the practice of IT management. IT management focuses itself on the supply of IT services and products and the management of the IT operations (Peterson, 2003). One well-known component of IT management is **IT governance**, which is associated as a component of strategic alignment, due to the fact that it has to be aligned to the corporate governance in order to create BITA (Luftman, 2000; Henderson & Venkatraman, 1993). The topic IT governance is described in chapter 4.1.Next, **Information Management** on strategic level is concerned with the roles and structures for the management of IT (and its information systems). The emphasis is on the relationships between the IT staff members, the IT users, responsibilities of the management (IT governance), management controls and the process of measuring performance (Sabherwal, R. & Chan, Y. E. ,2001). Chapter 4.2. describes Information Management, which is the fundamental principle of the Amsterdam Information Model (AIM): Information Management accompanied with **business and IT alignment (BITA)** is namely one of the key matters when it comes to creating innovative IT solutions. In the chapter thereafter (4.3.), attention will be paid to the phenomenon of BITA which is the fundamental principle of the Strategic Alignment Maturity Model (SAMM, Luftman 1999; 2000; 2007). In this research, the SAMM will be applied to learn what measures are taken to achieve BITA within Dutch universities. Good Information Management is in turn related to the BITA criteria 'communication' and 'value' (Luftman, 1999; 2000; 2007). The interrelationship between all the soft IT-perspectives and its expected results are given in the following figure 3.b:

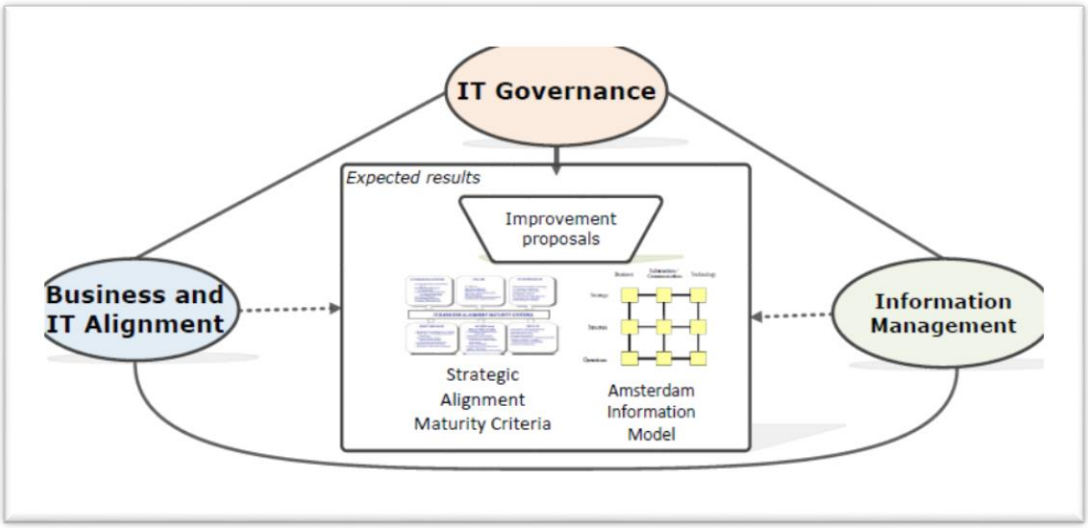


Figure 3.b: Interrelationship between soft IT-perspectives and expected results

After every chapter from 4.2., a concluding definition will be given to place the subject in the context of this research. This will result in the understanding of the covered subjects that are interpreted within this research.

4.1. IT Governance

An important factor that enhances the creation of innovative IT solutions is IT governance. IT governance can be referred to leadership, organizational structures, policies, procedures, systems and processes which ensure that the IT of an organization supports the organization's strategy and objectives (ITGI, 2003; Van Grembergen, 2001; Venkatraman, Henderson & Oldach, 1993).

IT governance ensures that information technology can be sustained, allowing it to be extended to business goals, enabling business and IT alignment, resulting in the optimization of IT investments, while taking culture, organizational structure (centralized versus decentralized) and strategy in account (Van Grembergen, 2001; Symons et al. 2005). Thereby, the subject 'IT governance' is an important component for the creation of BITA.

According to Symons et al. (2005), the important elements of IT governance are:

- Structure – Who makes the decisions?
- Process – How are the decisions about IT and its investments made?
- Communication – How are these decisions monitored, measured and communicated?

Within this research, the term IT governance will be used to indicate what processes have to be conducted and who is involved within this process to create innovative IT solutions.

The possibility might exist that interviewees denounce problems within their university, related to IT governance.

Structural issues

For developing and/or improving IT governance, there should be knowledge about the structural and/or organizational elements within the IT governance streams (Symons et al., 2005).This means that the IT could be centralized, decentralized, federated, or project-based.

The following table (2) explains what these principles:

Structure	
Centralized	IT systems, infrastructures, data, budgets, etc. reside at corporate level, where the IT is centralized under a single CIO.
Decentralized	IT is decentralized per faculty/institute: Every unit has got its own people in charge, knowledge, etc.
Federated	The centralized IT organization supports IT work spots via infrastructure and enterprise wide implemented applications via a shared services environment. Individual business units (faculties and/or institutes) maintain and develop their own applications and maintain the budgets for these faculty specific systems.
Project-based	The IT resources are placed in one reporting structure with the resources and staffing centralized within one location. The organization is built around the resource pools that the centralized IT department delivers.

Table 2: IT governance Framework: Structures, Processes and Communications (Symons et al.; 2005, p.4)

4.2. The Amsterdam Information Model

Central to the discipline of the creation of innovative IT solutions, is the concept of Information Management. A model that will be used in this research (research question 1) is the Amsterdam Information Model (the AIM). Information Management is an important aspect, due to the fact that the AIM is created for supporting BITA, but also for depicting Information Management roles, processes, etc.

4.2.1. Information Management

According to Choo (2014), Information Management is the management of business processes and systems that utilize information on any way. Information Management is also described as an integrative discipline, which connects all information-related issues of an organization (Maes, 2007). Gartner (2014) adds that it is a method applying technology to collect and process information with the goal to create efficient management, wherefore organizations assign an Information Management function/role/department that facilitates the process.

Choo (2014) also states that the process of 'identifying the information needs' is one of the main tasks of any entity that performs Information Management. Kennisnet (2014) states that in many instances there is a big distance between the demand of the education and the delivered services and products by the IT organization(s) within these instances. By establishing an Information Management function within an organization, the gap between the demand of the education and the delivered services and products by the IT organization(s) can be bridged.

Nowadays, business and IT influence each other a lot and at the same time IT becomes more transparent and merges better with the business (Abcouwer, Maes & Truijens, 1997). A well-known relationship is found within the technology – business of an organization: The information services within an organization are mostly large and complex and at the same time established via complex information and communication processes, aimed to inform, communicate, coordinate and cooperate within an organization and between organizations (Abcouwer, Maes & Truijens, 1997).

4.2.2. The Amsterdam Information Model

The AIM originates from the practice Information Management. The AIM-framework was developed by Abcouwer, Maes and Truijens (University of Amsterdam) as an orientation instrument for Information Management. The AIM-framework concretizes the integrative character of Information Management: Linking strategic and operational level as the technology and business. This linkage facilitates addressing other Information Management problems within a context of an organization (Markosian, 2013).

Maes (2003) stated that Information Management can be defined within the AIM in the following squares (figure 4):

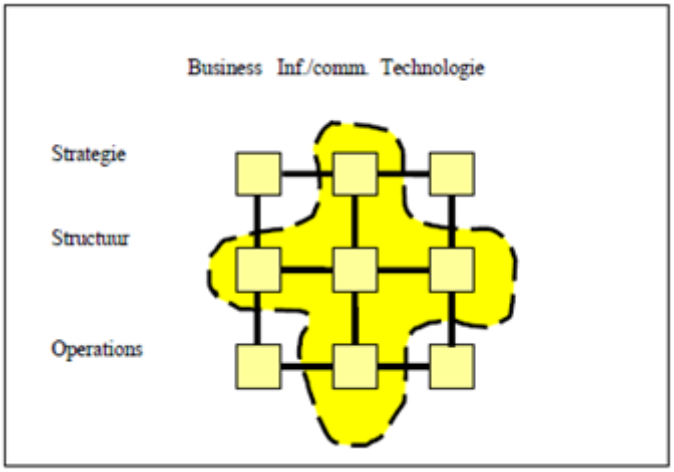


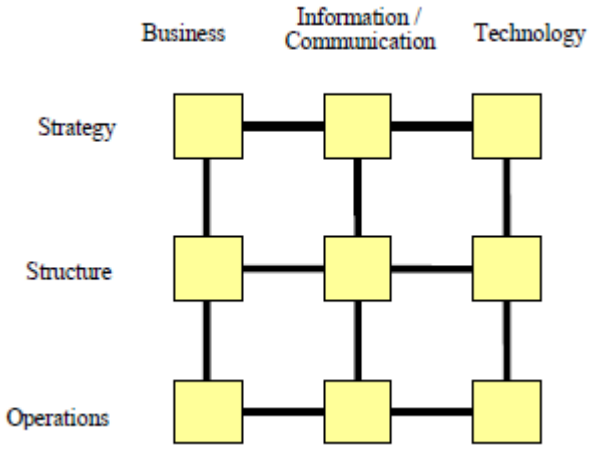
Figure 3: Information Management defined by Maes (2003, p.7)

The framework helps organizations by supporting business issues which are related to Information Management.

Both state that it is an integrative positioning framework, which allows the discussion about the different aspects within Information Management and elucidating all mutual dependencies (Maes, 1999; 2003; 2007). At the same time, Maes states that the model can be used to deal with the interrelationships between the business, information communication and technology levels between all organizational layers (from strategic, to structural (tactical) and operational layer within an organization. A framework like the AIM is marked as 'essential' when it comes to the clear understanding about the significance and nature of Information Management within theory and in practice (Maes, 1999; 2003; 2007).

Another use of the AIM is to get a clear idea of the alignment between business processes, the information necessary to execute these processes and the ICT used in the alignment. (Thiadens and Abcouwer, date unknown). The framework originates from the Strategic Alignment Model of Henderson and Venkatraman (1993), which clarifies how alignment takes place within four different sections within an organization (business, IT, internal and external domain within an organization), wherein Abcouwer, Maes and Truijens (1997) have added two more sections in the middle: Information communication and (infra)structure (or tactical level).

The AIM exists out of nine squares, which presents the business, information/communication and technology (from left to right). From top to bottom it presents the strategy, (infra)structure and operations.



- Technology (right column): The technology that provides the base of the IT, like the technology systems and databases.
- Information/Communication (middle column): The interpretation of information, its communication and knowledge (sharing).
- Business (left column): The application as a business expertise.

Figure 4: An integrative framework of IM, by Maes (2007, p.8)

Every component within this model has got a specific area of concern, but these are still connected with the other components. The full explanation from the AIM can be found in Appendix A.2.

4.2.3. Application of the AIM

Abcouwer, Maes and Truijens (1997) argue that the AIM is specifically popular within government and semi-government institutes. This gives an extra reason to apply this model within this research to Dutch universities.

Theoretical application

Research has shown that the AIM can be used for some purposes, but it is not clarified *how* the framework can be used. A research to the application of the AIM (Markosian, 2013) gives insights in these purposes: Communication, analyzing and advising, ordering and structuring, arranging the organization, redevelopment of the information provision and business and IT alignment[5].

Maes (2007) stated that the model is used for descriptive/orientating purposes, organizing and designing purposes and prescriptive and normative purposes.

Method of application within this research

The AIM will be utilized for the first research question to *arrange the organization,* whereby the framework is used to apply organizational design issues. A similarity has been observed between this research and the chosen method of usage of the AIM (described by Markosian). The ideal situation of the university can be visualized and depicted on the AIM-framework.

Markosian (2013) argues that '*arranging the organization'* can be implied on two ways:

- *Positive implication*: The framework is used to gain insights into governance structures. One can create clarity about responsibilities and interrelationships that take place within an organization.
- *Negative implications:* The following implications occur when the framework is used as a strict 'norm' for organizational design:
    - Whenever the framework is used as a blueprint for the establishment of an organization, there is always the chance of negative implications like a too strict division of responsibilities. The negative implication appears when the squares of the framework are interpreted as organizational departments, from which each have their own roles and functions. This could lead to 'islands' within a company, resulting in communication gaps due to poor interwoven governance structures.
    - When a distinction is made within domains and organizational layers, the integrative approach could be hampered.

[5] Markosian (2013) clearly emphasized that the framework cannot be used to create BITA, due to the fact that BITA can never be created via simply using a model. The process of creating BITA is more complex (see chapter 4.3.). Maes et al. (2000), state that the framework has proven to be a valuable frame of reference for the relationship between business and IT within a Dutch governmental agency. From this it can be concluded that the AIM gives a visual representation between the relationship of the business and the IT.

Both implications lead to criteria for the purposes of applying the AIM to 'arrange the organization' (Markosian, 2013):

- Criterion 1: The framework should not be used as a normative model;
- Criterion 2: The framework should not be used as a blueprint for organizational design;
- Criterion 3: The framework is intended to be used to address organizational design matters.

Criterion 1 does not apply. While using the framework, criterion 3 will be fully applied within this research. Criterion 2 will be taken in consideration partly: The model will be used as a general blueprint of an ideal organizational design.

The difference between the approach of this research and the approach of Markosian (2013) is that the 9 squares of the framework will not be treated as 9 different organizational departments or domains and layers, but as 9 squares that could contain various people, roles and departments, each with their own responsibility.

Summarizing the goal and the usage of the AIM: The AIM-framework will be used to 'arrange the organization' via describing the current and ideal situation within a Dutch university. With this, the framework will depict a general blueprint of an organizational design, wherein each square contains various people, roles and departments with their own responsibility. With this information, the governance structures for the allowance of the improvement of the delivery of innovative IT for education can be illustrated.

4.3. Business and IT Alignment

Another related subject to this research is Business and IT Alignment (BITA). To understand this research better, this chapter will sketch a clear picture about the definition of BITA and how it can be assessed. The theoretical background is needed to understand research question 3.

4.3.1. What is business and IT alignment?

There are different explanations and interpretations of the principle BITA. Henderson and Venkatraman (1999, p. 476) described BITA as "the degree of fit and integration between business strategy, IT strategy, business infrastructure and IT infrastructure". Another synonym for 'fit' could be the 'linkage' (Baets, 1992; Reich and Benbasat, 2006) between the degree to which the IT mission, objectives and plans support and are supported by the business mission, objectives and plans. Luftman and Brier (1999) describe business and IT alignment as a applying IT in an appropriate and timely way which is in harmony with the business strategies goals and needs. In a later research, Luftman (2000) stated that BITA evolves in a later state within the business, by adapting the business functions and IT functions together.

According to Gutierrez and Serrano (2008), BITA is considered as a key element that improves organizational performance, enhance the efficiency and allow organizations to be more competitive in their respective industry.

Henderson and Venkatraman (1999) argue that BITA should be seen as **a process of continuous adaptation and change**, meaning that it cannot be compared with an event. Furthermore, Luftman and Brier (1999) argue that **there is not a single strategy or combination of activities that enable a firm to achieve and/or sustain alignment**, meaning that BITA is a combination of different processes, factors and influences. Alignment components are continuously changing and the interrelations between these components likewise.

Whenever an organization is successfully aligned, the following should be observed according to Luftman and Brier (1999) and Luftman (2000):

An organization:

- Allows its IT and business capabilities to be weighed equally;
- Gives possibilities to develop all skills that are necessary for the success;
- Empowers workers in an environment that is team based
- Gains agreement on all outcomes that are required from the business processes;
- Instils a sense of urgency in managing IT-enabled projects;
- Leads in the deployment of IT in order to create customer value;
- Gets strong support from senior management and has got strong leadership;
- Nurtures an open culture, encouraging open communication, trust, appropriate prioritization;
- Has a thorough understanding of the business and IT environments.

In this research, the terms BITA and strategic alignment refer to the concepts above.

4.3.2. Why do BITA?

Luftman (1999; 2000) presents a lot of valuable information when it comes to successfully aligning the business and IT, but what is the value of being successfully aligned?

One reason is the realization of value from IT investments, achieving the maximum benefits from their information systems resources and identifying those areas in what an IT investment will deliver the best benefit for the organization (Hale, 1995; Tallon & Kraemer, 2003).: This is hardly impossible whenever there is a lack between the business and IT strategies within an organization (Henderson & Venkatraman, 1999).

The second reason is that BITA also gives more insights into and creates more awareness about the opportunities on strategic level, resulting in a better competitive positioning by means of IT after responding in the right way on these opportunities (Boynton & Zmud, 1987; Porter, 1985) and insights in costs (Galliers, 1993).

Another reason to create a better BITA is that it helps establishing a strong working relationship between organizational departments and it helps increasing the overall organizational performance (Ullah & Lai, 2013).

4.3.3. What is the problem with creating BITA?

The process of creating BITA does not go flawless. Organizations cope with problems in realizing BITA within their organizations.

Tallon and Kraemer (1999; 2003) have made an overview that explains the dimensions of strategic alignment (synonymous for BITA on strategic level), with the visualization in figure 6 of the pitfalls within this process.

Figure 1: Dimensions of Strategic Alignment

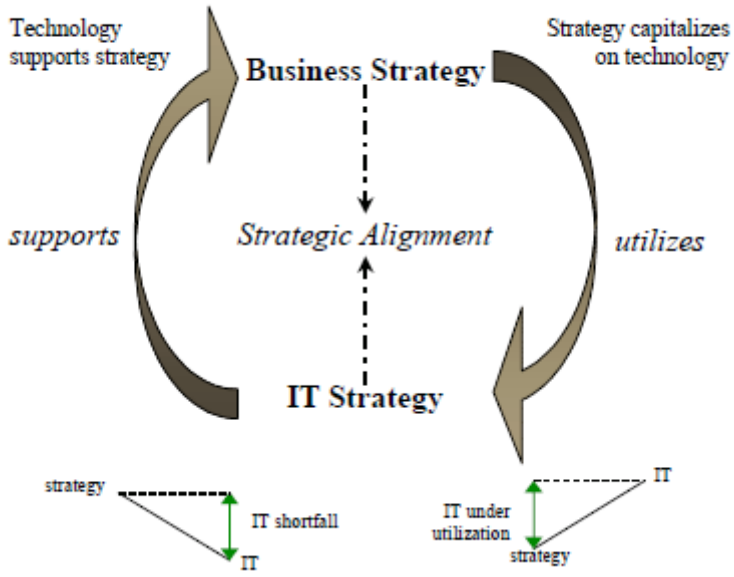


Figure 5: The Dimensions of Strategic Alignment (Tallon & Kraemer, 1999, p.3; 2003, p.6).

In the model, a representation of the business strategy and the IT strategy are made. The IT supports the business and the business utilizes the IT. In case of **an IT shortfall,** there is a failure in the IT: It fails in providing adequate support for the business. Whenever there is a **strategy shortfall**, the business strategy fails to take full advantage of the existing IT. The strategy shortfall results in not making use of the business opportunities.

Baets (1992) states that problems form an obstacle to forming a good BITA. He states that in some organizations commitment to and involvement in IT strategy and planning is lacking. Another inhibitor is a lack of clear understanding and measurement. As an addition to his, Luftman and Brier (1999) stated the inhibitors of BITA in figure 7.

INHIBITORS
IT/business lack close relationships
IT does not prioritize well
IT fails to meet its commitments
IT does not understand business
Senior executives do not support IT
IT management lacks leadership

Figure 6: Luftman and Brier (1999, p.4) Main inhibitors of IT and Business Alignment.

4.3.4. Application of business and IT alignment in Dutch universities

Ossiannilsson (2010) explains that universities are facing challenges in order to be competitive. Not only for their managerial, educational, technological and social aspects, but universities are the drivers for innovation and with that they contribute to sustainable development.

Zellweger Moser (2007, p.144) named the integration of technology within education in universities 'complex' and 'challenging: The internet, the continuous improvement of IT infrastructures and education related software resulted in the emergence of new business models within the educational industry. The integration of technology within education leads to adjustment of policies (related to copyright), creation of technology infrastructures, an IT support organization, etc. and with that the redefinition of the traditional teaching processes.

An important element in the process of creating innovative IT solutions is the planning of technology: Moran (1998) stated that aligning technology with institutional goals is important to make a step ahead into the future. Without technology planning, which is a part of BITA, it could be hard for universities to cope with the fast pace of change within the educational environment. The society demands more from universities, resulting in pushing these universities to improve their performance and quality (Ossiannilsson, 2010; Motjolopane and Brown, 2004; Pirani, 2004).

The role of ICT within universities becomes larger: Motjolopane and Brown (2004) argue that ICT gained prominence when it comes to improving traditional class-room based processes as education on distance. They also argue that alignment is a concern for tertiary-level educational institutions due to significant investments in IT for teaching and educational purposes, as well as in the improved administrative processes. Efficiency and effectiveness within universities can only improve if the business and IT are properly aligned. Pirani (2004) confirms this by stating that institutional and IT leaders agree that proper alignment leads to the optimal use of IT. With that, the leaders recognize the intrinsic value of technology within the institution.

Furthermore, it must be stated that the creation of BITA is a part of creating innovative IT solutions, due to the fact that both worlds have to cooperate to deliver the best results.

4.3.5. The Strategic Alignment Maturity Model

Research question 3 will focus on the Business and IT Alignment (BITA) on Dutch universities. To support the research with specific activities to reach BITA, the Strategic Business and IT Alignment Maturity-model (the SAMM) (Luftman 1999; 2000; 2007) will be used. This model displays an extensive list of BITA components as a result of Luftman's investigation.

The SAMM is normally used to measure the maturity of the BITA (on strategic level) within any kind of organization. The maturity is an indication of the level of BITA within an organization.

This model will be used to find out what aspects of the SAMM are used. 'The level' of usage will only be measured to learn if a specific factor is applied. It will give insight into the practices within Dutch universities for aligning the business and IT. The maturity of the Dutch universities will not play a role in this research and will not be mentioned.

The SAMM measures the alignment between the IT entities (departments, roles, etc.) and business, via six components:

- *Communications:* This describes the effectiveness of the exchange of ideas, knowledge and information between the IT entities and business. Whenever this happens properly, the company's business and IT environment, strategies and plans, risks, priorities etc. become clearer, resulting in enabling the company to achieve these.
- *Value measurements:* At this component, measurements are used to demonstrate the contributions of IT and the IT organization to the business which the IT entities and business both understand.
- *Governance:* Answers who has the authority to make decisions about the IT and how IT priorities are set to allocate IT resources. The governance is aligned with the business strategy and delivers value within certain risk boundaries, taking the organizational culture, structure and strategy in account (Symons et al., 2005; De Haes & Van Grembergen, 2009).
- *Partnership:* Measures the relationship between the business and IT organization and the degree of trust between both organizations.
- *Scope and Architecture:* This describes the pace of supplying a flexible IT infrastructure, including the evaluation and application of new technologies, the important (enabling) process changes and the ability to deliver customized solutions to the internal organization, as well to the external partners and/or customers.
- *Skills:* The practices of human resources, like hiring, training, performance feedback, etc. The skills also contain a point of direction about the employees' readiness to change, its capabilities to learn and their ability to leverage new ideas.

Figure 8 gives a full description of the SAMM criteria:

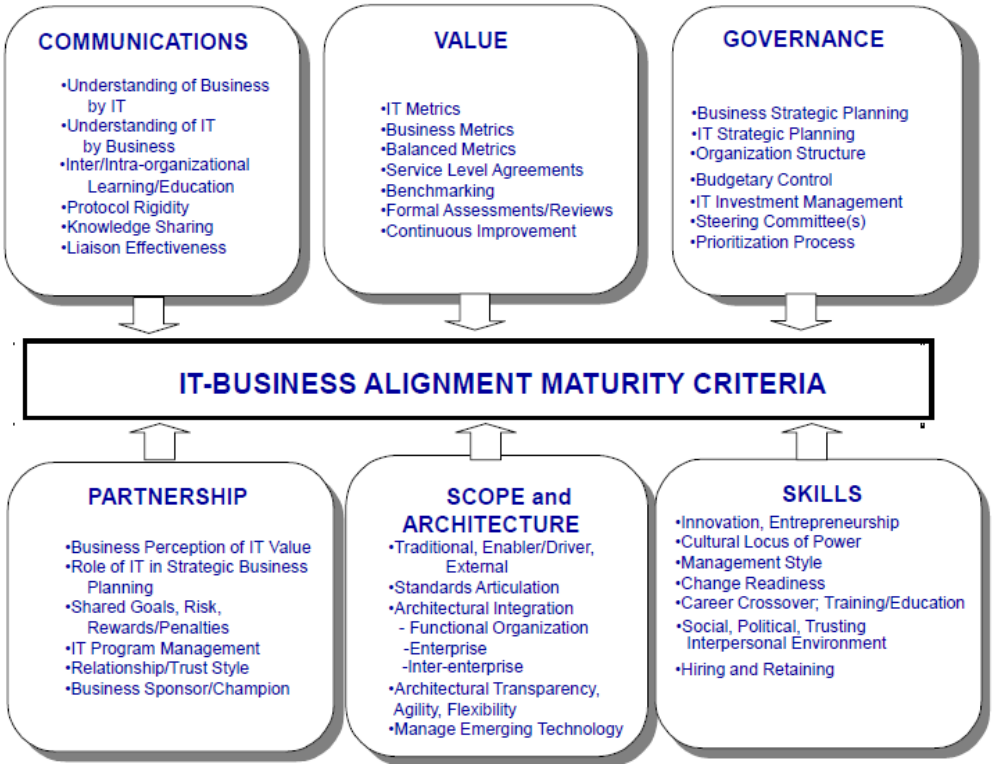


Figure 7: The criteria of alignment maturity, by Luftman (1999; 2000; 2007).

PART 3: EMPIRICAL PROOF AND RESEARCH RESULTS

Part 3 describes how the research methods were applied and links these to the empirical proof. At first, an explanation is given about the used research and analysis methods. The focus will be on the process of the usage of the research instrument. Next, the empirical results are addressed which answer the research questions.

Table of contents:

PART 3: EMPIRICAL PROOF AND RESEARCH RESULTS 38

5. Methods and instrumentation for research and analysis 39

5.1. Literature review 39

5.2. Interviews 40

5.2.1. Selection of interviewees 41

5.2.2. General description interviews 43

5.2.3. Processing the interview results 45

5.2.4. Processing the drawing results 46

5.3. Surveys 47

5.3.1. Procedures 47

5.3.2. Instrumentation 47

5.3.3. Statistical analysis 48

6. Empirical proof 51

6.1. Main observations 51

6.2. RQ 1: The ideal organizational structure 52

6.2.1. Sub question 1.1. 52

6.2.2. Sub question 1.2.: 53

6.2.3. Other observations 58

6.3. RQ 2: General improvement proposals 60

6.3.1. Results IT employees 60

6.3.2. Results students and teachers 62

6.3.3. Relation with other works 63

6.4. RQ 3: Contribution of BITA to creating innovative IT solutions 64

5. Methods and instrumentation for research and analysis

This chapter is concerned with the methodology used for this study. This empirical research makes use of the Grounded Theory method and multimethodology (see chapter 2 for more information). Via both methods, literature reviews and the conduction of interviews and surveys are established. At first, the process of literature review has been explained. In the second paragraph, the process of interviewing is explained from the selection of the interviewees, until processing all data. In addition, attention is paid to the 'drawing' of the ideal organizational structure for the creation of innovative IT solutions within the AIM. Chapter 5.3. elaborates on the procedures and instrumentation for the surveys, including the process of analyzing the data as a result of these surveys.

5.1. Literature review

A literature review has been conducted in order to collect theoretical data for this research. The first goal of the literature review was to gain and demonstrate familiarity with the existing knowledge about the topics related to this research. By creating familiarity to the topics, the credibility of the research and its associated topics are established. Another goal of the literature review was to summarize and integrate the most important existing knowledge about the areas related to this research, in order to create a theoretical framework.

The most used search engines for collecting literature were Google Scholar, ACM Digital Library and the Leiden University e-Library. Search engines like Google Scholar mostly refer to other university e-libraries, creating a better chance to find the relevant literature.

Literature review process

The first step of the literature review process was clarifying what literature useful was to create a theoretical framework.

The used keywords were mostly related to topics of: Business and IT alignment, innovating education, IT in education, IT governance, Amsterdam Information Model, Luftman, Rick Maes, etc. These keywords were also arranged in a different order or used in combination with other words. Relevant papers were selected based on the title and after reading the abstract. Subsequently, introductions were read to gain a view of the estimated added value of the paper for the research.

After collecting a numerous amount of papers, the process of the literature review started. From each paper, the index was read to create an overview of the topics of the sections and its sub-sections. Then the conclusions were read. If the paper was still relevant after scanning the conclusion, the whole paper was read, and if not, the paper became excluded from the literature collection. The relevancy was determined by applicability of the conclusions within general sectors of businesses or specifically within educational instances.

While reading the whole paper, notes were made to mark relevant findings and an eye was kept on the limitations. If the limitations were too big, resulting in the probability that the conclusions are far from generalizable and unusable for this research, the paper was still excluded.

Whenever relevant data was found within a paper, these findings were quoted in a separate document under the original source names. This process created a list which contains different titles and findings. If certain findings were quoted from other researchers, then their papers were also read and eventually quoted, in order to create a complete pool of valid information.

Other relevant criteria:

- The vast majority of the used literature are peer-reviewed;
- The amounts of citations were not considered decisive for the choice of a paper. Although: The used literature for this research is commonly cited.

5.2. Interviews

Interviews were targeted to gather information about which organizational structure would be the most feasible in order to create innovative education with the usage of IT.

The interviews were held at three universities of the 13 public universities in The Netherlands. The choice is based on the willingness of the respondents to cooperate with this study.

The universities that were researched contain the following elements:

	University B	University C	University E
Total amount of workers	3200		
Academic staff	1100	2500	2800
PhD students	650	300	260
Education and research support	306	1900	1900
IT	200	150	200
Amount of students	21000	18000	24500
Domains			
-Social	X		X
-Technical	X	X	X
Division IT	Federated	Centralized	Centralized

Table 3: Rounded Data [5] of Researched Universities

The relationship between how innovative IT solutions are created within Dutch universities and BITA is a discussion which concerns the IT organization of a university and the educational business itself.

At first, test interviews with both parties gave insights in how the IT and the business thought about the process. Then, by interviewing IT staff members at first, a view is created of how they see the process from their point of view. These insights gave more pinpoints to create questions for the students and teachers because it was previously known how both parties could think. Both approaches gave a good perspective of the way of thinking of the different organizational principles.

5.2.1. Selection of interviewees

This subchapter gives insights in who are interviewed and why and how these people are chosen.

Selecting IT staff members

Per university, four to five persons were interviewed in positions differing from strategic, tactical and operational level of an IT (related) department within a university.

The interviewees were selected on basis of the tasks they perform and their relationship with the delivery of innovative IT solutions for students and teachers. There is consciously chosen to interview IT staff members that have something to say about the interfacing between IT departments and business: They have a better understanding of what is going on within the university through their contacts and their daily cooperation with both IT department(s) and business and the level where they operate on.

Before the interviews, inquiries were made about how IT was organized: In case the university works federated/decentralized, people from the decentralized departments would be interviewed. One method to find out who can be interviewed concerning the process of delivering/demanding innovative IT within a Dutch university, was contacting different IT departments of universities and obtaining, via informal conversations, more insights about this topic. This lead to names of people who operate on the intersection of the IT department and (educational) business or a direct connection with the person concerned. Another method of selecting people was via personal networks and (online) telephone books of universities.

The following IT staff members from universities were interviewed:

UNIVERSITY	TOTAL PARTICIPANTS	POSITION
B	5	Director Shared Service Center ICT
		Head Information Officer
		Faculty manager (technical faculty)
		ICT & education coordinator (social faculty)
		IT support worker (social faculty)
C	5	Head Information Management for education and student affairs
		Enterprise Architect
		CIO/CTO
		Demand Manager
		Coordinator ICT & education
D	4	Advisor ICT and education/teacher
		Project Manager for IT innovation
		Product Manager
		Corporate information manager/Enterprise Architect
Total	14	

Table 4: List of interviewed IT staff members

Selecting students and teachers from the educational business

It is essential to take the educational business of a university into account in order to gain a complete view. From the three universities that have been researched, two were picked out to research the educational business. Interviewees were selected from the universities which differed the most of each other. There has been chosen for the two extremes to be able to generalize the results of the 'business' better. These extremes were found in universities B and C. At first, the IT division of University B is federated, while University C is centralized. University B has just started with reorganizing its IT division, while University C finished reorganizing years ago. Thereafter, from the drawings can be concluded that the IT departments of the two universities do not resemble each other, whilst University D has got an IT division that is the most similar to University C.

The interviewees from the business were selected by their function: They were either a student or a teacher. Teachers with a management function or high responsibility for an educational program or a faculty were a pre. Ancillary activities of students like a membership to Faculty Counsels or Boards of Education were also preferred. The reason behind this is that these people might be able to tell more about the process of creating innovative IT solutions, due to their responsibilities within the universities and their insights via extensive contacts with other students and/or teachers, enhancing the chance to give a proper answer to the head and/or sub questions of this research.

UNIVERSITY	TOTAL PARTICIPANTS	POSITION
B	5	Assistant teacher
		Professor
		Teacher/ educational coordinator (technical faculty)
		Student technical faculty (member Faculty Counsil)
		Student social faculty (ex-member Faculty Counsil)
C	5	Teacher / Programme Director technical study
		Teacher / Programme Director technical study
		Teacher / Programme Director technical study
		Student (Student Counsil Member)
		Student (Student Counsil Member)
Total	10	

Table 5: List of Interviewees of the educational business

5.2.2. General description interviews

Interviews with IT staff members

The interviews that were conducted with the IT staff members were semi-structured. The main reason for semi-structured interviews is that the research is done via Grounded Theory: Semi-open questions give the possibility to explore new areas and gain general information about IT governance, structures, processes and principles within these different universities. Thereby it creates the possibility to ask more questions to clarify the unknown. Another reason for using semi-structured interviews is that the IT staff members all have other functions and/or are employed on other departments. The open character of the semi-structured interviews help gaining information from their points of view, while still being able to keep the red line. For all interviews the order and formulation of the questions were not established.

At the interviews with the IT staff members, another research method was added: The drawing. For some questions, the interviewee was asked to draw an organizational structure within the AIM. The interviewees were also asked to describe certain processes to create insight in how innovative IT solutions are created. The description helped the IT staff members visualize the processes, which supported the drawings.

Interviews with students and teachers

The interviews that were conducted with the students and teachers were all semi-structured: The interviews contained a structured part and an unstructured part. In the structured part, closed questions were asked from which the formulation of these questions is already established. Within the unstructured part, one to three open questions were asked, from which the formulation and the order is not established (Leiden University Lexicon, 2014).

The interviews were semi-open to allow asking new questions in case some topics had to be clarified.

Beforehand it was expected that the students and teachers did not have much knowledge about the creation of innovative IT solutions or about any other IT services, due to the fact that many of them do not use or know about this possibility. This expectation lead to the decisive point not to let the students and teachers draw within the AIM. Due to their unfamiliarity with the AIM and the process of creating innovative IT solutions, unreliable results could be expected.

Description of the interview process

Before the interviews took place, all interviewees were informed per e-mail about the goals, the structure and the methods within the interview. Another section was presented to the IT staff members about the underlying theory of the AIM in order to get the interviewee acquainted with the model.

At first, the IT staff members were interviewed to create a general view from different perspectives of what is happening on the field of IT within the universities. The derived information was advantageous for the following:

- The results were valuable to estimate the amount of students and teachers that had to be interviewed. Thereafter, to make the research manageable, the input is used to make a choice to interview people of two universities that have the least resemblance: This resulted in a higher chance to gain more significant data to make broad interpretable statements about the subject;
- The insights from the IT staff members about the situation within the universities concerning the IT helped formulating more targeted interview questions for the students and teachers, which lead to more insightful interview results that gave answers on the main and sub research questions.

The interviews with the IT staff members took place within the researched universities in closed spaces, trying to reduce the impact of external noises. The interviews with the students and teachers were carried out by telephone.

At every interview, extensive notes were taken to describe the main issues and most important facts: The notes supported the interview process by giving insights in situations described by the interviewee and helped reminding the interviewer the explained important events. Furthermore, the notes helped the interviewer summarize certain events explained by the interviewee, to verify if these events were understood properly. All interviews were recorded for further processing and analysis purposes.

The interviewee was free to provide extra feedback and information until one month after the interview. However, this possibility remained unused.

5.2.3. Processing the interview results

Transcribing

To process all the data of the interviews, the interviews were transcribed and coded. The interviews were recorded and transcribed as an audio file. The transcription of the interviews happened on verbatim base. The recordings and the transcriptions guarantee the completeness of the interview data.

After transcribing the interviews, the full recording was replayed and at the same time the transcription was proofread, checked for errors and at the same time corrected where needed. Then, the interview notes were compared with the transcriptions in order to find out if there were notable events. In that case, the transcriptions got another section where these events were noted after carefully considering if they still applied as facts after transcribing the text.

Coding

The interviews serve a research goal. It is highly important to keep these on a usable and a relevant manner (Raymond, 1992). A method to do this is via coding: The transcript has to be provided by codes. To code words within the transcriptions, three forms of coding were applied: Open coding, axial coding and selective coding (Boeije, 2005). The following steps were taken in order to code:

1. Open coding:
    a. Unravelled the transcriptions and classified the relevant information;
    b. Defined the codes and its categories.
2. Axial coding:
    a. Determined if the codes that were defined previously were sufficient and useful for the research. Then the useful codes were clustered by categories;
    b. The codes were described and provided with corresponding data;
    c. A list was created with tested codes with corresponding data.
3. Selective coding:
    a. The tested list was structured with corresponding data and provide relations between codes with data;
    b. Codes were compared with literature to see if the information can be theoretically grounded;
    c. The codes were interpret and a ‘coding model’ was created wherein the codes are placed.

All coding categories can be characterized as **'all-inclusive'** (all relevant response codes fit within a particular dimension) and **'mutually exclusive'** (via well-defining the dimensions to make sure that a code does not fall into two or more categories at the same time) (Raymond, 1992), to make sure that the coding categories are useful. To find that out, the process of coding was made iterative, meaning that the transcriptions were continuously analyzed and coded (and eventually corrected) at every phase. While re-coding, the reliability of the codes were continuously tested: Via re-reading the transcriptions without the codes and recode again in order to see if the same codes were given.

Translating to results

To determine the research results, the interview results will be only be included **when at least two of the four or five interviewees per university** have the same statement about a certain subject. There has been chosen for this minor amount of equivalent results, due to the various principles where the interviewees belong to. These principles differ from each other in that way, that the chance that the same statement would be given is minimal.

5.2.4. Processing the drawing results

The analysis of drawings within the AIM (or any other model with drawing purposes) does not have any academic validated approach. This leads to processing the drawing results via a method that has similarities with academic validated approaches: Based on the different drawings, one final drawing had to be the end result via 'calculating the mean'.

At first, the drawings were grouped per university: University B had 5 drawings, University C had 5 drawings and University D had 4 drawings, from which the amounts of drawings were based on the amount of interviewees per university. Then, the drawings were traced on a plain AIM-framework.

The areas that were selected by the most by the interviewees to point out a certain entity, were considered as **the main focal points**. The main focal points had to cover at least the choice of 60% of the interviewees. These focal points were marked, based on the specifications of the interviewees. Thereafter, there was looked at the 'outliers'. The 'outliers' are defined by the points that have been chosen by less than 40% of the interviewees via the drawings. Then, there is looked for if there is any overlap by the remainder 40%: Based on available remainder, there has been defined another focal point. In case 1 of the 5 interviewees (University B and C) drew something completely different in comparison with its colleagues, then $1/5^{th}$ extra is added to the main focal point. In case of 1 of the 4 interviewees (University D) drew something that differed significantly from the other workers, then $1/4^{th}$ of extra is added to the main focal point.

To support the drawings analysis process, explanations for the drawing from the interviewees were played to get a better sense of why an interviewee chose to draw something in a certain way.

The whole method is applied to form a complete view with input from all interviewees, all weighed equally via drawing with the principle of the mean.

5.3. Surveys

Surveys were used to gain data to answer RQ 3. The goal of RQ 3 was to find out what SAMM-components are applicable to Dutch universities, in case they want to improve their pace of creating innovative IT solutions.

5.3.1. Procedures

When drafting the questionnaire, attention is paid to the formulation of the questions and the answer possibilities. The focus was on the applicability of the questions to the academic educational sector:

- The questions are easily interpretable, whereby there is only one explanation per question available. When the questions of Luftman were too hard to understand due to specialist jargon, an extra explanation was given;
- Luftman's SAMM presents answering possibilities that indicate maturity levels. These answering possibilities were translated to components which are important to create BITA, without pointing out maturity levels: Meaning that the questions should only be answered with a 'yes' or 'no', or eventually a nominal or ordinal level. These answering possibilities were translated in such way that they cover all answering possibilities of Luftman's SAMM. At the same time, the focus was on formulating the answering possibilities SMART and not giving any suggestion for answering;
- The questions contain no examples to prevent confusion within the different universities (due to their different structures and processes).

Not all questions of Luftman's SAMM are used within the questionnaire. Some questions are either too far-fetched, due to they are not in relation to the creation of innovative IT solutions, that they are non-issues (such as career opportunities) and/or that they will provide socially desirable responses. The questions that are removed, including the reason of removal, can be found in Appendix C.

The surveys were sent to workers of IT departments of the universities. At first, the IT staff members that were interviewed were requested to fill in the survey and send it to their colleagues. Secondly, the survey is spread within the network of the KPN Consulting Government & Education department, wherein they were requested to spread the survey within their network with IT staff members that meet the requirements of the target group.

5.3.2. Instrumentation

The used survey tool is Google Forms, via Google Drive. This application has the advantage that it displays all results directly tabulated, in pie charts or in lists. Moreover, it offers efficient methods to modify and distribute the survey. A disadvantage of this tool (similar to

other online tools) is that there cannot be guaranteed who completed the survey. To minimize the risk, the respondents were asked to fill in general organizational data and optionally their e-mail addresses (in case they would like to receive the end results). This data was used to verify the existence of the respondent. However, the possibility still remains that the data is not filled in by the rightful respondent, which could dent the validity and reliability of the answers.The analysis tool of the quantitative data for RQ 3 is Microsoft Excel.

5.3.3. Statistical analysis

The questionnaires consists out of:

- 18 dichotomous questions;
- 19 nominal multiple choice questions;
- 1 ordinal multiple choice question;
- 1 open nominal question;
- 4 questions for demographic data, from which two are nominal multiple choice and two are open questions.

The first part of the questionnaire exists out of four demographic questions. The demographic data is used to categorize the answers of the respondents. The demographic data does also increase the reliability of the data, due to creating the possibility to monitor the actual existence of the respondents.

The dichotomous questions gave the respondents the possibility to indicate if a BITA component is applicable or not. The nominal multiple choice questions gives the respondent the possibility to choose which subcomponent is the most important for a university to create BITA.

Overall data analysis

The analysis of the statistics is based on the type of quantitative results. Google Survey creates a list that automatically presents percentage distributions in pie-charts for the dichotomous and nominal multiple choice questions. These percentage distributions make it easier to interpret the results. Presenting and analyzing a list of single variables, displayed on in any graphical representation, is also named: Univariate analysis (Ghauri & Gronhaug, 2005).

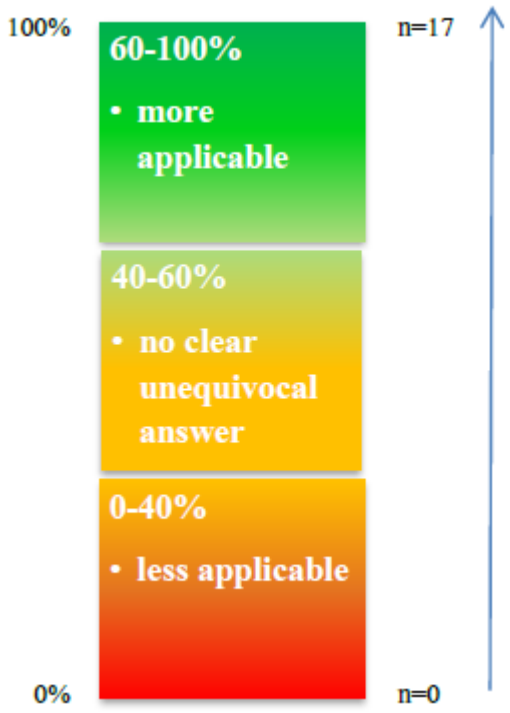


Figure 8: Distribution of applicability of a certain BITA criteria

When the majority, which is more than 60% of the respondents, have chosen for the same answer within the questionnaire, then the component will be considered as more applicable and will be included in the end results. When between the 40% and 60% of the respondents have chosen for a certain answer within the questionnaire, then the component will be marked as 'no unequivocal' answer. When between the minority, which is 0% and 40% of the respondents, have chosen for a certain answer within the questionnaire, then the BITA component is less applicable.

The distribution is displayed within Figure 9. Within this research **there will not be drawn any strong conclusions**, due to the low amount of respondents.

Contingency tables

To present statistical relationships, contingency tables were constructed via cross-tabulating the demographic data and other questionnaire results. To create this, the independent variables and dependent variables had to be determined. At first, the percentages within the categories of the independent variables were calculated, in order to compare the percentages within the categories of the independent variable for one of the categories of the dependent variable. Thereafter, the percentage difference across one of the categories of the dependent variable was calculated. The difference of the percentage is the measurement of the strength of the relationship between the two variables.

These contingency tables were created for all questions and results within the questionnaire. For the nominal multiple choice questions, the modus was calculated in order to find out which value has been chosen the most.

The four demographic questions focus on the following:

- A. Name of Dutch university where respondent is deployed;
- B. Name of department of the Dutch university the respondent is deployed;
- C. The function of the respondent;
- D. The level of deployment of the respondent.

After closing the questionnaire, there could be concluded that questions B, C and D are unusable for contingency analysis, because the functions and departments of the cooperating universities differ too much from each other.

Moreover, it was impossible to create subcategories for the functions due to the organization of the universities and the functions of the respondents differed too much. In addition, it is noticeable that people classify themselves higher for organizational levels (D) than they actually are (based on the interviews). These presumptions decrease the reliability of the data, resulting in only using question A for cross tabulating the results. The significance of question A is higher, due to it could state differences between IT professionals of the different Dutch public universities.

All results of the notable contingency tables are disclosed in chapter 6.3. The list with all end results can be found in appendices A.2 and C.1.

Other analysis methods

In case the data cannot be ranked (multiple choice), than the data will be described on verbatim base.

The sample of the data does not represent its parent population, due to the fact that there is a clear insufficient amount of respondents. The parent population is estimated on 2275 IT staff members for all Dutch public universities[6]. The sample size is estimated on 329. The data will not undergo more analysis, because the results will remain meaningless.

[6] 13 Dutch public universities multiplied by the average amount of IT workers per university, which is 175.

6. Empirical proof

This chapter presents the findings of this research, focusing on the three key themes that have been described in chapter 4 (Related Theories). In the first paragraph, the main observations (and observed limitations) are explained. Thereafter, the results per research question are given per paragraph.

6.1. Main observations

The main observations from the interviews and the drawing during the interviews were as follows:

- ***Explanations were given about concepts/statements/situation from different perspectives:*** These perspectives come from the various positions held by all the interviewees. These positions are on operational, tactical and strategic level of the chosen university. By viewing the university from different angles, a lot of information is gathered which leads to a discussion
- ***Explanations were given about the processes from their viewpoints:*** All interviewees explained how the process of creating innovative IT solutions is structured and what departments, people and other entities deal with this process. The explanation could be given on high level, or on operational level.
- ***Feedback was given on what goes wrong within the university and how the processes could be improved:*** Almost all interviewees were able to give a description about what goes wrong within the universities, how this could be improved and what measures should be taken.
- ***Illustrations of situations within the AIM were made:*** Each interviewee from the IT departments has drawn a specific situation within the aim.

Furthermore, some limitations were observed within the questionnaires: The non-response rate is not available, but is expected to be high. The reason is that it is unknown how many times the requests for participation in the questionnaires are send out from KPN consultants to IT workers of universities and from interviewed IT workers to their colleague IT workers within the same university. The reason for a high non-response rate can be declared by at least two known reasons:

- Many Dutch universities currently go through reorganizations, wherein IT workers are unavailable for other events;
- Individual IT workers are not well-willing to participate due to any reason.

In total, 7 questions of the SAMM were neither added, nor removed, nor missing from the questionnaire. Appendix C.3. gives more information about the questions with their corresponding incorrect inputs. More information about the limitation can be found in chapter 8.1.

6.2. RQ 1: The ideal organizational structure

RQ 1: Is there an organizational structure on the basis of the AIM framework that would allow Dutch universities to improve the creation of innovative IT solutions for use by students and teachers in the education process?

Based on the drawing results, no detailed organizational structure was found. In contrary to the depiction of the demand, demand management and supply of innovative IT solutions, which could be found. The results make part 1 of sub question 1.1. invalid.

6.2.1. Sub question 1.1.

The first sub question exists out of two parts: The first part describes how the ideal organizational structure (for allowing Dutch universities to improve the creation of innovative IT solutions) looks like. The second part describes why a certain organizational structure could not be found. The results state that no ideal organizational structure can be found, resulting in the rejection of the first part and the acceptation of the second part of sub question 1.1.

Part 2: What are the reasons for the inability to draw an ideal organizational structure with regards to the AIM framework that ideally allows Dutch universities to improve the creation of innovative IT solutions for students and teachers to give and take education?

There are different reasons that cause an inability to draw an ideal organizational structure within the AIM. At first, 14 respondent have drawn an AIM that presents their view of the current organizational structure of their university. After they were asked if their drawing had to be improved for a new organizational structure (that allows the improvement of the creation of innovative IT solutions), 9 of the 14 respondents have answered that their current model does not change.

Only a small number of respondents indicated that there is an ideal organizational structure for their university: Some interviewees (from university B) argued that the Information Managers should work be on the tactical level, while others were content with the organizational structure.

Furthermore, it was striking that some interviewees did not draw the situation according to the indications that have been given preceding the interviews. Some interviewees have drawn departments/roles different in such a way, that it was almost impossible to find similarities with what their colleagues have drawn. Thereby, some interviewees have mentioned and drawn different roles in comparison with their colleagues.

Further analysis of the drawings have shown that the differences between the researched federative university and the centralized universities are too big. The IT-departments (the supply organization) are all organized differently: Some universities have IT related entities

which operate under other names, or some universities have other tasks per entity within the IT department.

6.2.2. Sub question 1.2.:

Is there, according to the IT staff members of Dutch universities, a specific structure with regards to the AIM framework that depicts the demand of innovative IT solutions, the supply of innovative IT solutions and a component that 'collects' or 'gathers' the demand and then translates it to a solution, which can be executed by the supply organization?

All IT staff members of the three researched universities have drawn their perceptions of supply, demand and demand management within the AIM. The end result of this question is a merging the three drawings of the three researched universities.

The findings are as follows:

University B

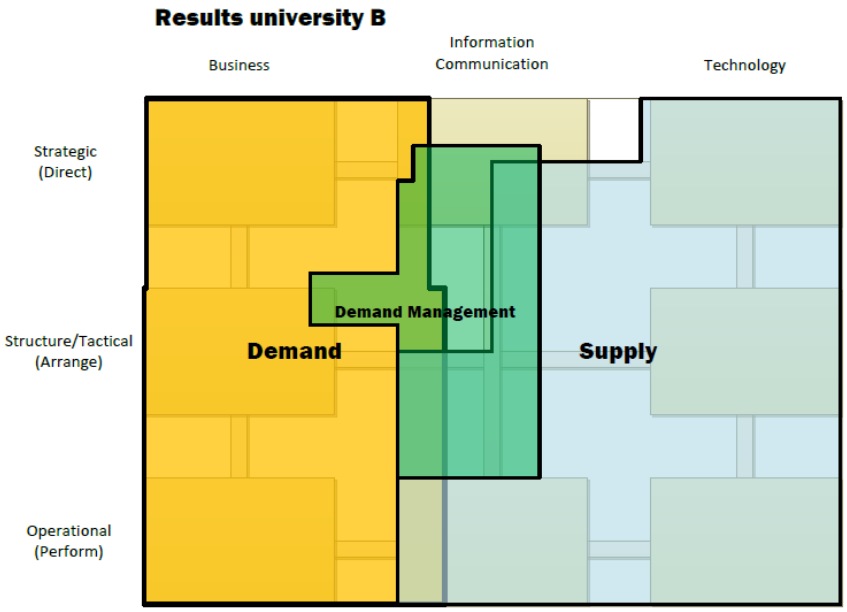


Figure 9: Results Sub Question 1.2., University B.

The results of sub question 1.2. for University B are summed up in figure 10.

As visible, the demand fully covers the *Business* on all three layers and partially the *Information/Communication* on all three levels. The supply of innovative IT solutions is fully covers *Technology, Information/Communication* on operational level and partially on the tactical and strategic level. The principle of *Demand Management* can be found on *Information/Communication* on the tactical and partially on the strategic level and for a small part on the tactical business level.

The striking part is that the top of the strategic level on the Information/Communication side is not covered by any of the three principles. It is not clear why this part is uncovered.

Another result of University B that stands out is the depiction of the principle Demand Management within the business-part. Every faculty within University B has got an Information Manager and/or an ICT and education coordinator who both deal with

measuring and collecting the demand. Both roles operate on the faculty itself, which is the reason for the interviewees to draw them partially within the tactical *Business*-side, in contrary with how the IT staff members of the other two universities have drawn the Demand Management-role.

University C

The results of sub question 1.2. for University C are summed up in figure 11. An important fact that influence the drawing is that University C has got a clearly assigned roles that specifically deal with the principle Demand Management, including a role which is named *'Demand Management'*.

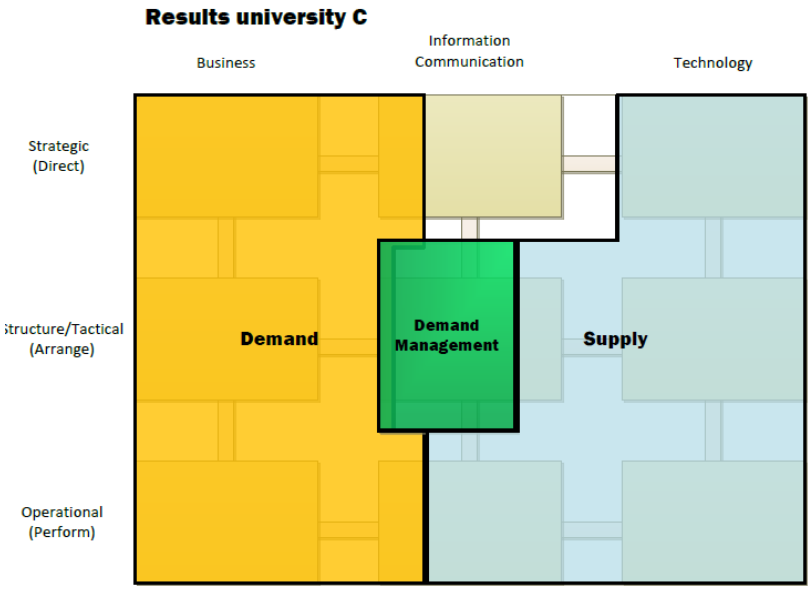


Figure 10: Results Sub Question 1.2., University C.

As visible, the demand fully covers the *Business* on all three layers and partially the *Information/Communication* on all three levels. The supply of innovative IT solutions fully covers the *Technology*-part, *Information/Communication*-part on operational level and for a small part on the tactical and strategic level. The principle Demand Management can be found on *Information/Communication* on the tactical and partially on the strategic level and for a small part on the tactical *Business* level.

One striking result is that the strategic level on *the Information/Communication* side is not covered by any of the three principles. It is unclear why this part is uncovered. Another result of this model is that the demand management only covers the *Information/Communication*-part on tactical level, meaning that this principle does not operate on other organizational levels within the organization.

University D

The results of sub question 1.2. for University D are summed up in figure 12.

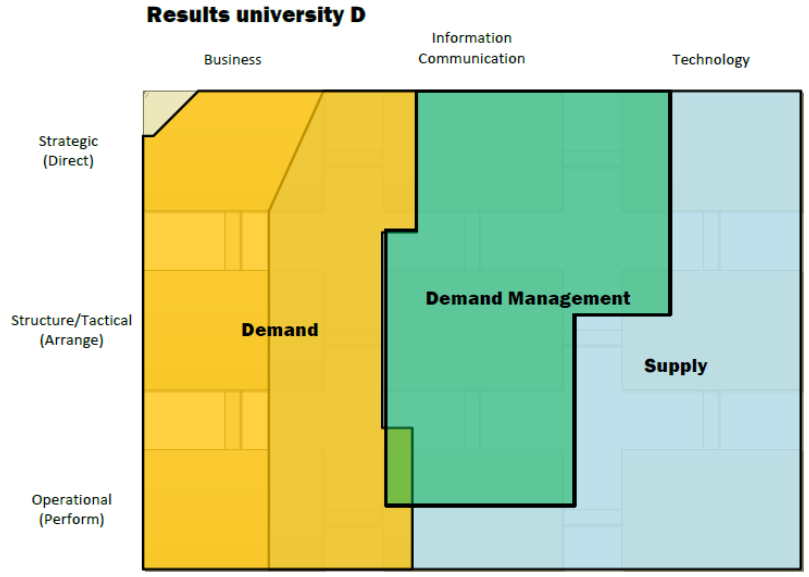


Figure 11: Results Sub Question 1.2., University D.

The depiction of the *'demand'* and *'supply'* of innovative IT solutions within University D looks partially like the results of the other two universities, except that the supply also covers the complete *Information/Communication* – side, but also a partially the *Business*-side within the AIM. This is notable, due to the fact that none of the interviewees of the other two universities have stated that the supply of innovative IT solutions happen within the demand.

A significant result from figure 12, with reference to universities B and C , is that Demand Management also covers the strategic part of the *Technology*-part and the top of the *Information/Communication*-part on operational level, which is the opposite result with respect to the other two universities. The reason hereof is unclear.

End result

The answer on the sub question is: **Yes, there is a specific structure with regards to the AIM framework that depicts the demand of innovative IT solutions, the supply of innovative IT solutions and the component demand management that collects/gathers the demand and then translates it to a solution which could be executed by the supply organization.** The end result of combining the results of the three universities together is depicted in figure 13.

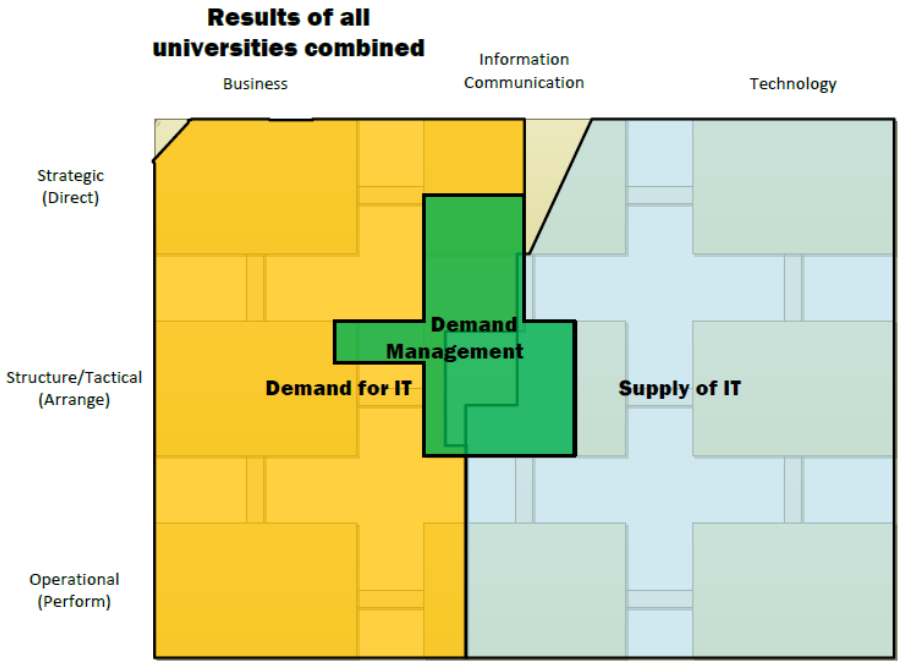


Figure 12: Results Sub Question 1.2., All Researched Universities.

An interesting result is that the *strategic-I/C*-square is partially uncovered. According to Abcouwer, Maes and Truijens (1997, p. 8) *strategic-I/C*-square is there for the following issues:

- How does the organization configures its information governance, while taking the business requirements and the IT (im)possibilities in account?
- On which level of knowledge management aims the organization on organizational-level, business-unit level, department level and/or workgroup level?
- Does the organization knows the specifications for appreciating and clarifying knowledge?

It seems that for all the interviewees' one or more of these three issues remain unused when it comes to the demand for innovative IT solutions, the supply of IT innovative IT solutions and the management of the demand.

Demand and supply

The demand of innovative IT solutions can be found within the business and partially within the *Information/Communication*-part, which is the most aligned to the *Business*-side.

The supply of innovative IT solutions happens on all three levels of *Technology* and partially on all levels on the *Information/communication*-part.

Demand Management

The principle Demand Management is mostly drawn within the *Information/Communication*-square on tactical level, partially on strategic level and also partially within the *Business*-side on tactical level. What strikes is that the Demand Management-organization within Dutch universities is drawn small with reference to the Demand and Supply organization. The following findings have been observed:

- The interviewees of the IT departments have pointed out that the principle **Demand Management is a necessity within a university**, due to the inability of many students and teachers to formulate their IT related questions, demands and requirements properly. According to the IT interviewees, the most of these students and teachers do not possess the (technical) knowledge to express their needs for IT[8], which is logically explainable.
- All universities have arranged roles to fulfil the tasks of the principle Demand Management, but have named these roles differently: University C filled this principle with a department '*Demand Management*', the roles business analysts and an instance for education and student affairs. Universities B and D have fulfilled the principles with the functions Information Managers, Education/ICT coordinators and even with a whole Information Management department.
- The chosen Demand Management-square within the AIM of figure 13, has similarities with an entity wherein Maes's definition of 'Information Management' can be found (chapter 4.2.2., figure 4). The process of 'identifying the information needs' (Choo, 2014 and chapter 4.2.1.) as a sub process of Information Management, is seen by the interviewees of the IT departments as an important process of the principle Demand Management. Due to the similarities between figure 4 (Maes, 2003) and between the AIM of the interviewees of the IT departments (figure 13), it can be inferred that **the principle of Demand Management within Dutch universities is similar to the principle of Information Management, described by Maes (1999, 2003 and 2007).**
- According to Maes (1999, 2003 and 2007), the *Information/Communication*-level has been integrated in the AIM to create a link between the business and the IT (see chapter 4.2.2.). In figures 10, 11, 12 and 13 it is visible that the interviewees of the IT departments pointed out that they also see the *Information/Communication-square* on tactical level as a link between business and IT (the demand and supply of IT ,see chapter 4.2.2.). Based on this relation it can be concluded that **within Dutch universities, the principle of Demand Management can be found within the AIM on at least the *Information/Communication*-square on the structural/tactical level.**

[8] There is an exception for students and teachers with technical backgrounds.

6.2.3. Other observations

Limited access to the target group of IT professionals

The first observation is a limitation that came with accessing the right level of stakeholders in universities. Preceding the interviews, it was hard to tell which stakeholders are involved with the process of creating innovative IT solutions.

The intention of this research was to investigate different universities and its people who are employed on different layers and faculties. The people from these different universities should approximately all be employed on the same level and should have the same responsibilities. The investigation would be done by means of interviews. Preceding and during the investigation it was barely possible to interview people from which all have similar functions and are deployed on the same level.

In fact, a preliminary investigation has been conducted which lead to some hypotheses, which needs to be further validated as it was unable to access the right levels in the universities within this research.

This observed limitation is visualized in figure 14. The figure gives a clear indication of the spread of the IT staff members in terms of organizational level. The indications of the functions are based on estimations. The estimations in its turn are made on basis of the task descriptions of the interviewees, given by the interviewees themselves. The squares cover the areas of operation per IT staff member that has been interviewed. Each colour stands for a different university.

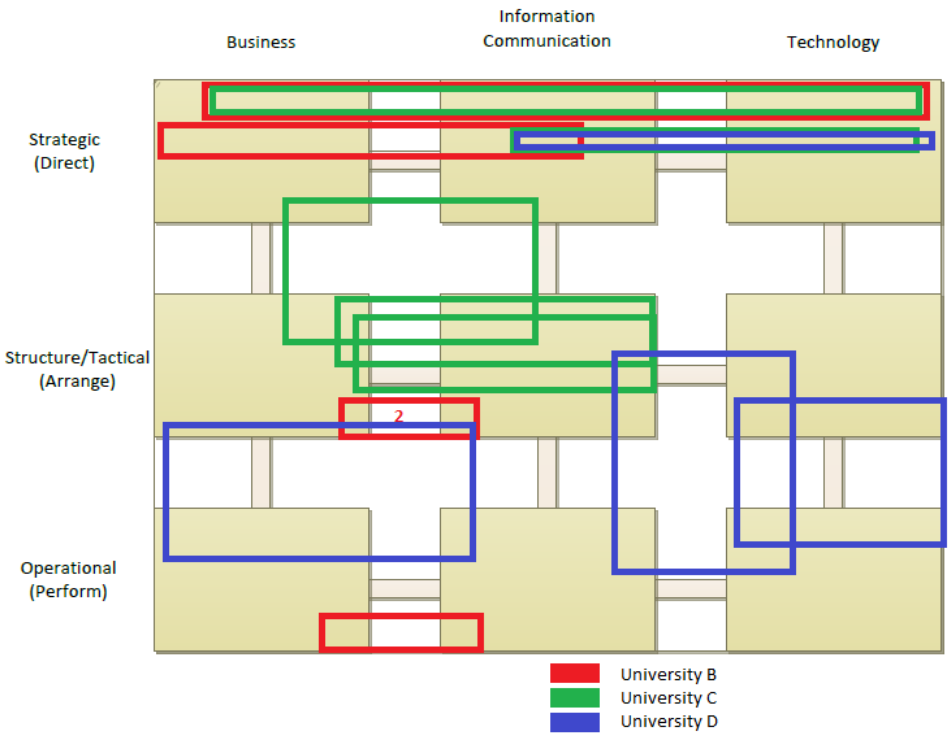


Figure 13: Visualization spread of levels of operation per interviewed IT staff member

As can be seen from the figure, there is no equal spread of interviewees per level. The figure gives an indication that some organizational levels are covered with the corresponding interviewees, and that some boxes remain uncovered. Thereafter, it is visible that the spread per university (targeted with the boxes) remains unequal: The coverage of the interviewed staff of

University B (red boxes) is relatively narrow in tactical and strategic areas as related to *business* and *information/communication*. The interviewees from University C are depicted by the green boxes. The green boxes prove that the interviewees are mostly deployed on tactical *information/communication level.* The interviewees from universities B and C are positioned in the opposite of University D: The interviewees from University D (blue boxes) are mostly deployed between the operational and tactical level, whereby the field of operation of these employees has a wide spread. University D had more interviewees that were deployed on *technology*-levels with respect to universities B and C.

Based on this information, it can be stated that the results drawn from this research, are mainly based on the interviews with a majority of mid-level managers.

Operational level

As it has been stated before, IT staff members were interviewed who work on the intersection between business and IT. Preceding the interviews it was assumed that these professionals have more knowledge about the IT and the business.

The sample group mainly consist of people that do not work on the operational level. As an exception, the following has been observed: Whenever the IT within a university is federated/decentralized, it often happens that operational workers know more about the business because they are directly deployed within the business. In addition, the tasks on the federated/decentralized university were mostly not clearly divided, leading to operational workers having multiple tasks that vary per situation. Within a centralized organization this is mostly not the case: Operational IT staff members mostly perform their tasks for the whole university (mostly IT support) and the tasks are very specific. Based on this information it could be stated that operational staff of a university with a centralized IT organization, are often unfamiliar with the processes related to creating innovative IT solutions.

The creation of innovative IT solutions is mostly organized differently per faculty. Not all students and teachers are acknowledged with how innovative IT solutions are created. In case they are acknowledged, they only know it from their area of study. The most likely reason for this is that a lot of students and teachers are engaged with activities on the operational level of a university. In addition they are mostly only familiar with the part of the university in which they operate. The focus on their own field of study has the effect that they are (partially) unaware about events elsewhere in the university.

Thereafter, properly indicating problems related to IT is mostly hard for people without a technical background.

6.3. RQ 2: General improvement proposals

In this paragraph, RQ 2 will be answered. The formulation of RQ 2 is the following:

How could the process of creating innovative IT solutions be improved?

To assess how the process of creating innovative IT solutions could be improved, IT workers, students and teachers were interviewed.

6.3.1. Results IT employees

Whenever the IT employees were asked how they want to improve the process of creating innovative IT solutions, all answers of the interviewees were related to a faster delivery of innovative IT solutions. **The biggest bottleneck is that the delivery of innovative IT solutions goes too slow**. At the same time, existing techniques and solutions improve and new techniques and solutions are marketed. Due to this high pace of innovation, it is a necessity to deliver innovative IT solutions faster to keep up with the emergence of new innovative IT solutions.

There were no resemblances in improvement propositions between the three universities. Due to the different structures of the university and the various positions that the interviewees were holding, the different propositions are given per university.

University B (federated):

- *Decision makers should be more ICT minded:*
  It is important that the decision makers from the educational business should be ICT minded. In the interest of the process of creating innovative IT solutions, being ICT minded is important, resulting in the chance of thinking along with the process more optimally.
- *An Information Manager that collects the demand should operate differently:*
  This applies to universities with a decentralized IT organization, operating with an Information Manager per faculty/department. The Information Managers should inform themselves more about the situation on the operational level: They should encounter the workplace to collect information about the state of affairs regarding the IT usage, problems, etc. Namely, collecting the demand from the users is time consuming. However, the Information Managers should operate more tactically in order to fully utilize the information he/she collected to eliminate problems or improve innovative IT solutions.
- *The university should make more resources available:*
  Less budget, people and other forms of capacity related to the creation of innovative IT solutions lead to the fulfillment of fewer projects, which does not benefit the process. Therefore, more resources should be made available.

- *Many processes, IT hardware and software should be standardized:*

  Not working uniform throughout the university is complex and gives user problems due to the difference per faculty. Via standardization this complexity will be taken away and the management of these processes, IT hardware and software will be eased. The effect on the creation of innovative IT solutions would be that it would be easier to select and/or to invent an innovative IT solution that actually fits the organization.

University C (centralized):

- *The demand of the teachers and students should be unified:*

  By unifying the demand, the demand can be channelized better in order to create a better overview of what is required by the business. An example of unifying the demand could be is channelize the opinions of first year students per faculty.
- *Cooperation between different principles within the university is a necessity:*

  Intensified cooperation is essential for the creation of innovative IT solutions. It is beneficial for the progress of an innovation project. However, a division of responsibilities should be maintained and good agreements should be made to manage expectations within the projects.
- *Enhance the interaction with the users (demand):*

  The users (demand) should be more involved within the innovation process to improve their relationships with the Demand Management and IT (supply) organizations.

University D (centralized):

- *Think from the customer's point of view:*

  The IT should think more from the view of the students and the teachers in order channel the demand more efficiently and effective. The last does also support providing innovative IT solutions to a complete unit rather than individuals.
- *The focus should be on the usage of the solution:*

  Consideration should be given to how innovative IT solutions should be applied within the education, focusing on the didactics. In order to find out in how far the innovative IT solution is usable, an experimental pilot should be done. Two interviewees have indicated that the amount of pilots should be increased in order to create the solutions faster. Thereby, a pilot can indicate whether an investment should be made to implement the innovative IT solution throughout the whole university, or not.
- *More structural representation of the educational business is needed:*

  University D has got an incidental structural representation. The drawback that comes with it is that the IT department cannot evaluate the service provision. In case the students and the teachers organize themselves via a structural representation

(which could be a teachers' council or a faculty council, etc.) the demand could also be mapped better.

- *Involve less stakeholders and reduce the associated processes:*

  Interviewees stated that the current process of creating innovative IT solutions has a time consuming project initiation phase wherein too many different stakeholders are involved. According to their different political interests and the difficulty to convince them, the process gets delayed due to laboriously reaching to an agreement. The interviewees have highlighted that too many discussions and proposals precede the start of a project. The delay as a consequence is detrimental for the process of creating innovative IT solutions. Moreover, the development of new innovative IT solutions goes faster than the current projects, resulting in already new technologies before the existing projects are implemented. To improve this process, fewer stakeholders should be involved and fewer processes should be conducted within the initiation phase in order to shorten the process. Via reducing the duration of the initiation phase, the development/acquisition of the innovative IT solutions will be eased.

6.3.2. Results students and teachers

The students and teachers were asked how the process of requesting and suggesting for innovative IT solutions could be improved. **The emphasis of the interviews is on the beginning of the process of creating innovative IT solutions**, due to the fact that it cannot be expected from these interviewees that they have any knowledge about IT projects.

University B

Three of the five interviewees of University B have characterized the process of creating innovative IT solutions as **inadequate,** despite the fact that these people are members of faculty counsels or teachers. The main reason behind this is that it is ambiguous to whom they could turn to if they have an idea for an innovative IT solution or even feedback about it.

According to the same three interviewees the process could be improved via better guidance. Improved guidance is reached via clarifying how the process for the creation of innovative IT solutions works. The main point of contact should be clear if a student or teacher would suggest a possible improvement that is IT related.

University C

In contrary to university B, three of the five interviewees of University C have characterized the process of creating innovative IT solutions as **adequate.** These three interviewees were either a programme director, or members of the student councils.

Hence, the two members of the students' councils that have been interviewed stated that the process of creating innovative IT solutions is **inadequate for students**, due to the fact that many students do not know where they should turn to with their suggestions/ideas. One programme director stated that the process is inadequate due to a shortage of capacity and resources for the creation and/or implementation of an innovative IT solutions.

The interviewees of University C have gave improvement propositions that differed too much from each other. The two main examples are: Channelize the demand of students and acquaint them for this specific channel. Thereby, the programme director stated that the delivery of more decentralized IT solutions could be the solution to deliver innovative IT solutions quicker.

6.3.3. Relation with other works

Additionally, it is hard to classify the improvement proposals that have been given in the previous paragraphs. Therefore, a comparison is made with the Luftman's (2000) BITA criteria from the SAMM to find out if the improvement proposals contribute to the creation of BITA.

Improvement proposal	Alignment Criteria	Alignment Sub Criteria
"Decision makers should be more ICT minded"	Communications	Understanding of IT by business
"Many processes, IT hardware and software should be standardized"	Scope and Architecture	Standards Articulation
"Cooperation between different principles within the university is a necessity"	Partnership	Relationship/Trust Style
"Think from the customer's point of view"	Communications	Understanding of business by IT
"Less bureaucracy"	Skills Partnership	Locus of Power Management Style Change Readiness Social, Political Trusting Environment Relationship/Trust Style.

Table 6: Relation between improvement propositions and Luftman's strategic alignment criteria

As it can be seen from the data in Table 6, 5 from the 11 improvement proposals can be linked to alignment criteria of Luftman (2000).

The finding confirms the association between improving the process of the creation of innovative IT solutions and the creation of BITA for the same purpose. Thereby it could be stated that the creation of BITA could be important for a certain business process.

Another interesting similarity was found between the improvement proposals and the TPACK (Koehler & Mishra, 2005; 2009).

Interviewees of University D stated that the focus should be on the didactics when an innovative IT solution has got to be selected. TPACK states that the didactical, content and technical knowledge of the teacher is important for effectively teaching with technology. If new innovative IT solutions are focused more on the didactics in teaching, the usage of the solution would be optimized and the experience with the solution could be enhanced.

6.4. RQ 3: Contribution of BITA to creating innovative IT solutions

This chapter will give an answer on the third research question:

> ***RQ 3: To what extent do Luftman's strategic alignment criteria contribute to the delivery of innovative IT solutions for education in a situation without any constraints?***

Out of the target group of 2275 IT staff members of all Dutch universities, the survey was sent to 20 people (with the request to forward it to their colleagues), from which 17 surveys were returned. Even though the statistical significance of n=17 is insufficient, the results still show how IT professionals of Dutch universities think about the components for the creation of BITA which support the creation of innovative IT solutions. The results of the survey are illustrated in Appendix A.3.

The bold marked and underlined terms are the components for BITA of Luftman that are processed in the survey. The explanation behind the Luftman components are the results of the questionnaire. Per criteria, a description of the interpretation of the results is given.

BITA criteria: Communications

- *Understanding of IT by Business*: The educational business should understand the IT for BITA.
- *Understanding of Business by IT:* The IT should understand the educational business for BITA.
- *Inter/Intra-organizational Learning/Education*: There should be a possibility for evaluation and mutual learning within a university in order to create BITA within a university.
- *Protocol Rigidity:* The degree of informality should be high in order to create BITA within a university.
- *Knowledge Sharing:* The sharing of knowledge between the education and the IT within a university is an important factor for creating BITA.
- *Liaison Effectiveness*: Effective collaboration should be more important than working individually to create BITA within a university.

Based on the resulting associated criteria for the factor communication, an emphasis should be on the 'protocol rigidity' as a criteria due to the fact that the respondents state that there should be an informal structure. Thereby, all Luftman's communication criteria for BITA are of importance within Dutch universities.

BITA criteria: Value

- *IT metrics:* IT measurement values should be related to educational values and be able to be translated to educational measurement values and eventually to external partners.
- *Business Metrics:* In case of requirements for measurements of the education, the opinions of the respondents remain divided. Respondents state that two the measurements of the educations should at least be related to the education (41%), or at least be related to only the IT and eventually external partners (53%).
- *Balanced Metrics*: To create BITA, there should be a relation between the measurement values of the education and the IT to make the performance of both entities measurable.
- *Service Level Agreements:* Formulating service level agreements (SLA's) are important to create BITA.
- *Benchmarking:* Benchmarking should be done in order to create BITA within a university.
- *Formal Assessments/Reviews*: Formal project evaluations should be carried out in order to create BITA within a university.
- *Continuous Improvement:* There has to be a process of 'continuous improvement', applied on humans, processes, services and products, etc. to create BITA within a university.

In case of 'Value', the results have indicated that all BITA criteria are applicable within Dutch universities, except for the criteria 'Business Metrics'. Respondents have stated that the requirements for measurements for education should only be related to the IT, or only to the business. However, it could still be stated that all respondents think that measurements of the education should be applied within Dutch universities.

BITA criteria: Governance:

- *Business Strategic Planning:* Strategic planning should apply to the entire organization and should (if possible) even be integrated outside the organization.
- *IT Investment Management:* 65 % of the respondents state that IT investments should be seen as costs for effective business processes, the acquisition for big applications, etc. 12% of the respondents state that IT investments should be seen as costs for performance, maintenance and management issues. However, 35% of the respondents state that the management of IT investments should be managed in

another way, from which 23% state that IT investment management should happen for both cases.

- *Steering Committee(s):* Decision-making entities should cooperate formally and should communicate formally and effective.
- *Prioritization Processes*: The prioritization of IT investments should happen responsive: Projects should be prioritized before they start up.

Two criteria are not incorporated in the end results due to various reasons (see last sub paragraph of this chapter). For the remainder, all named governance criteria are applicable in case of creating BITA within Dutch universities, except for the management of IT investments. For that criteria no unequivocal application within Dutch universities could be found.

BITA criteria: Partnership

- *Role of IT in Strategic Business Planning:* The IT department of a Dutch university should be involved within the drafting any strategic educational governance. The majority of the respondents from university B and C (65%) state that mainly the representatives of the IT department should be effectively be involved within drawing up the strategic educational governance, where the IT should also be seen as a resource. However, 35% of the respondents state that the IT department should not take part in the creation of the strategic educational governance, but IT should be treated as a resource at the decision making process. Contingency tables state that the 35% of the respondents who chose for that answering possibility, are the minority (15-20%) of the respondents of the three researched universities.
- *Shared Goals, Risks, Rewards/Penalties*: To create BITA responsibilities and eventual risks concerning the usage of IT should be jointly allocated to the educational-organization and the IT department.
- *IT Program Management:* The results of this criteria state that there should at least be an entity that is responsible for decisions that impact students and teachers within a Dutch university. According to 59% of the respondents, the end responsibility for the decisions that have should be available and should be assigned to the management/board of directors. 29% of the respondents have stated that there should be a different (unnamed) entity/person that takes the responsibility. The halve of the respondents of university B (federated), have stated that the responsibility should be on faculty level, while all respondents of university C (centralized) have stated that the end responsibility for IT should be for the management/board of directors, or any other related department that manages IT on high level.
- *Relationship/Trust Style*: To create BITA within a university, the relationship between the educational-organization and the IT department should both be based on the valuation of a service provider and in addition there has to be a partnership between the two.

Based on the results of the questionnaire, it could be stated that the IT should involve the business and vice versa in decision making processes and that both parties have to create and maintain a partnership for the benefits of the university. Both entities should also be responsible for the goals and risks for the Dutch universities to create BITA. Within these results, two criteria are not incorporated due to various reasons (see chapter 6.1. and appendix C.3.).

BITA criteria: Scope and architecture

- *Traditional, Enabler/Driver, External:* The scope of the activities of the IT departments should be that they are an entity that makes business processes possible, allowing IT products and services to be an important part of the daily activities for the education, according to the majority of the respondents of university C. The results also state that the scope of the activities of the IT departments should not only be limited to an entity that makes business processes possible, allowing IT products and services to be an important part of the daily activities for the education, but also by influencing the educational strategies (18%) or in any other (unknown) way (18%).
- *Standards Articulation*: Standards should be defined for educational processes university-wide and should be compulsory, but in contrary: 29% of the respondents state that standards should only be applied on faculty/departmental level. Contingency tables state that the last is the choice a part of the (+-30%) of the respondents of University C (centralized) and the halve of the respondents of University B (federated). This is striking, due to the fact that university C is centralized, but as the results state, a part of the respondents state that organizational standards should be applied on the faculties instead of throughout the whole university.
- *Architectural Integration in Functional Organization:* The information architecture on faculty level should be integrated throughout the whole faculty and should interconnect academic departments and institutes.
- *Architectural Integration in whole Enterprise:* To create BITA, an enterprise architecture has got to be developed for the whole university, and should eventually be integrated to partners and external entities.
- *Architectural Transparency:* The IT architecture should be transparent and flexible to an increasing extent. In that way, the entire infrastructure could possibly undergo a change.

The opinions of the respondents remained divided about how the IT should be seen and on how standards should be articulated. However, when it comes to the IT architecture within Dutch universities it could be stated that architectures should be integrated throughout a whole university whereby distinction between faculties should be minimized. Thereby should the architecture be flexible and transparent.

BITA criteria: Skills:

- *Innovation, Entrepreneurship:* For BITA, a university has got to stimulate and welcome innovation and entrepreneurship within the organization.
- *Locus of Power*: There should be an end responsibility for decisions that have an impact on students and teachers within the university and it should be assigned to the management/board of directors.
- *Management Style*: In case of management style, 59% of the respondents' state that the input of whole organization (operational, tactical and strategic level) should be taken in account in any decision making process for the university. While 41% of the respondents claim that the strategic management and the tactical management are the only two entities who should be able to make managerial decisions. Contingency tables state that the opinions are divided within the participating.
- *Social, Political, Trusting Interpersonal Environment (Change Readiness)*: According to the IT staff that filled in the questionnaire, the willingness to change of the teachers, students and the IT should be high in order to be able to make significant changes.

For the 'skills' criteria, it can be stated that innovation must be stimulated. This implies that the readiness for change should be high under the students and teachers and that the end responsibility for all decisions within a university should be at the management/board of directors. However, it is not clear which organizational levels should deliver input to the management. Two sub-criteria are removed from the question possibilities. The reasons for removal are described in Appendix C.3.

All results from the questionnaires, including the impact on the existing Luftman SAMM, cannot be attributed to a specific event. Any option for reasoning is excluded and is beyond the research scope. Thereby, the events and changes with respect to the Dutch academic education sector cannot be explained.

PART 4: CONCLUSIONS, REFLECTIONS AND RECOMMENDATIONS

The following part presents the two final important parts of this research: The conclusions and the discussions and limitations. At first, the conclusions of all research questions and an overall conclusion are given. Next, the discussion is presented, along with the limitations and the opportunities for further research.

Table of contents:

PART 4: CONCLUSIONS, REFLECTIONS AND RECOMMENDATIONS 69

7. Conclusions 70

7.1. The ideal organizational structure 70

7.2. General improvement proposals 71

7.3. Contribution of BITA 72

7.4. Recap 72

8. Discussion, limitations and opportunities for further research 74

8.1. Discussion per RQ 74

8.1.1. RQ 1 74

8.1.2. RQ 2 74

8.1.3. RQ 3 75

8.2. Limitations 75

8.3. Suggestions for future work 77

7. Conclusions

The initial objective of this research was to identify how the creation of innovative IT solutions can be improved from the perspective of the process, via BITA alignment criteria and via an IT management/ IT governance framework. The first question in this study sought to determine a depiction of how the ideal organizational structure for universities looks like within the AIM. The second question was designed to determine how the process of the creation of innovative IT solutions could be improved. The third question in this research had the objective to identify what BITA criteria of Luftman's SAMM (2000) are used to align the business and IT for the purpose of the creation of innovative IT solutions.

For the first two questions, interviews were conducted. The interviewees of the investigated universities are deployed on different levels and faculties. In addition most of them have different functions and responsibilities. The intent was to investigate people with the same job functions and responsibilities on the same organizational layer. Pursuing the intent was unsuccessful, as a result from the job responsibilities, functions and level of the interviewees that differed much per university. Based on this, it can be concluded at first that the results of this research can be marked as a preliminary investigation which has to be validated further. At second it can be concluded that the results and conclusions of this research are mainly based on the findings from interviews with a majority of mid-level managers.

7.1. The ideal organizational structure

This research has shown that **no detailed ideal organizational structure could be found** with regards to the AIM framework, which allows Dutch universities to improve the creation of innovative IT solutions. The inability to draw an ideal organizational structure within the AIM can be attributed to the following:

- Little similarities between the illustrations of the IT staff members were found;
- The differences between the structures of the researched universities were remarkable, creating an inability to combine all drawings;
- Some bias during the drawing, due to not drawing organizational structures according to preceding indications.

In addition, if IT staff members from the same universities do not draw the same, it could mean that there is no shared vision of how the organization should look like and there is no shared.

A **general depiction of an organizational structure was found within the AIM** (RQ 1.2.). The depiction was enabled by the high amount of similarities between the drawings of the interviewees. The ability to draw the organizational structure for question 1.2. is attributable to the fact that only a few entities had to be depicted. Yet, the results of the second research question could not answer the main research question. From the drawings of question 1.2.

can be concluded that demand management (as a principle) does not happen on strategic level (according to the results within the AIM).

Interviewees indicated that they view the *Information/Communication* part of the AIM as the link between the Business and the Technology (or in their eyes, the hard IT), which is a confirmation of Abcouwer, Maes and Truiijens (1999) theory. Moreover, this study has shown that the principles and functions of Information Management and Demand management are similar to each other. This finding is based on the similarities between the job responsibilities of the Information Managers and Demand Managers of the researched universities. Both functions were depicted at the same place within the AIM by the interviewees, which covers the principle of Information Management as described by Maes (1999; 2003; 2007).

During the interviews, differences were observed between the tasks of IT staff members on operational level between the researched universities: Operational workers of the federated university had purely executive and no fixed job responsibilities (differed per faculty), while operational workers of the centralized universities had the opposite.

7.2. General improvement proposals

Another significant finding to emerge from this study is based on statements of the interviewed IT staff members: The majority declared that they were content with their current organizational division, whereby the improvement should be found within the innovation production processes.

The biggest bottleneck within creating innovative IT solutions is the slow delivery of these solutions. No resemblances could be found between the improvement propositions of the three researched universities. Based on this information it can be assumed that these universities differ too much from each other.

Within this research, 12 improvement propositions were found which are based on various grounds. Comparisons between the views of students and teachers (of two universities that differed the most from each other), have not lead to significant differences. It is apparent from the results that more clarity should be created for how ideas and suggestions for innovative IT solutions can be given by the educational business, especially for students. The results of the educational business reflect one of the results of the IT staff members: Both state that the demand should be channelized better. Another finding, based on statements of the interviewed educational business and IT staff members, indicates the difficulties which the educational business encounters with indicating IT related problems. This difficulty comes from their lack of knowledge about (the creation of innovative) IT (solutions).

The results were also compared with relevant theoretical frameworks. A relationship has been found between the following:

- The improvement proposals and the creation of BITA via certain criteria (Luftman, 2000), both for the purpose of creating innovative IT solutions. Based on this relation, it can be concluded that the creation of BITA could be important for business processes for the purpose of creating innovative IT solutions.
- The theory of the TPACK (Koehler & Mishra, 2005; 2009) and an improvement proposal. Some interviewees suggested that the focus of selecting innovative IT solutions should be on didactics, which is similar to a goal of the TPACK: Effective teaching with technology could only be reached when the teachers have didactical, content and technical knowledge. Via focusing on the didactic in teaching in creating innovative IT solutions, an optimized solution can be delivered.

Validating improvement proposals with existing theories puts an emphasis on the importance of taking the improvement propositions in account for creating innovative IT solutions.

7.3. Contribution of BITA

Although the current study is based on a small sample of participants, the findings suggest that not all Luftman's (2000; 2007) strategic alignment criteria are fully applicable within Dutch universities. Whereby the questions in the questionnaire were translated from maturity levels to yes/no or eventually different levels, the respondents still indicated that in some cases they do not want to have something in an extreme extent (related to a very high/low maturity level).

7.4. Recap

Technological development is taking a rapid loop nowadays (Gartner, 2014). The rapid technological development indirectly forces educational instances to create innovative IT solutions faster and to improve their corresponding processes. If universities are not able to keep up with the worldwide pace of creating innovative IT solutions, the impact on the education could be high. The technology of an organization today, can become unusable the next day due to the high pace of change (Abcouwer, 2014). State-of-the-art innovations are continuously marketed, while many Dutch universities take 1 to 3 years to implement an IT solution. The last could mean that some innovative IT solutions are already outdated at the moment of implementation.

Improvements in creating innovative IT solutions via the proposed solutions can make universities more dynamic. It creates an ability to offer more state-of-the-art, feasible and usable solutions to teachers and students to enhance and improve their teaching and learning performances. Via offering more varied methods of education, the perception and experience of the educational business, could be changed.

The present study makes several noteworthy contributions to our knowledge of creating innovative IT solutions. It points to how improvements can be made within Dutch universities with the aim of offering more and better innovative IT solutions for the usage of students and teachers. Lastly, it points out that the current situation within Dutch universities does not fully allow the creation of innovative IT solutions. This could be decisive for Dutch universities to change their processes in order to optimize giving and taking education.

8. Discussion, limitations and opportunities for further research

This chapter discusses the findings and conclusions and the included limitations for this research. The chapter will be closed with opportunities for further researches.

8.1. Discussion per RQ

It is under discussion to whose statements the research findings can be attributed. The first point of discussion is based on the level of operation of the interviewed IT staff members (see figure 14, chapter 6.2.3). The results of this research are mainly based on findings from interviews (and questionnaires) with **mostly** mid-range managers. The leads to the inability to generalize the findings and conclusions of this research to a representative group IT staff members from a Dutch university.

8.1.1. RQ 1

This study did not find a detailed ideal organizational structure that could be depicted within the AIM (research question 1 and sub question 1.1., chapter 6.2 and 6.2.1.). The inability to depict an ideal organizational structure has various reasons. The first explanation is that the positioning of depicted roles differed too much from each other, which could be attributable to the difference in the organizational structures per university. Moreover, different explanations and statements about concepts/situations were given, which can be attributed to the different functions that the interviewees hold. The different positions and the further responsibilities of the interviewees could influence their opinion and views about certain objects. These differences in positions and responsibilities made the findings from the interviews less usable.

In contrary, **a general organizational structure could be depicted within the AIM.** The ability to create a general drawing could be attributed to the limited amount of entities (3) and the similarity between the drawings of the interviewees. The test was successful as it was able to prove the following:

- The current organizational structures are sufficient for the creation of innovative IT solutions;
- The related business processes need to be changed.

Lastly, the successful use of the AIM in this research has proven that the framework could also be used for the depiction of large entities.

8.1.2. RQ 2

The second research question has shown that **improving the processes, which are related to the creation of innovative IT solutions, is more beneficial than rearranging an organizational structure**. The most improvement proposals, given by the IT staff members were related to making more resources available for better collaboration and interaction with

the demand group to improve the delivery. A possible explanation for this could be that the organizational processes, decision makers and other entities do not fully allow the improvement of innovative IT solutions for any (unknown) reason.

The lack of resources is assumed to be attributable to the budget cuts within the educational sector in The Netherlands.

All improvement proposals with a direct association with the demand (the educational business) for innovative IT solutions, could be related to a lack of knowledge about all occupations within the university. The educational business is mostly occupied with taking and giving education and to a lesser/no extent with IT. The proposal to reduce/eliminate bureaucracy could be related to the distribution of responsibilities over too many stakeholders.

These results are significant in at least one respect: It can be proven to a majority of the Dutch universities that the creation of innovative IT solutions should go faster via improving the associated processes. However, one improvement proposal seems in contrary with the freedom in creating innovative IT solutions: Interviewees stated that standardization of business processes and IT is needed to improve the creation of innovative IT solutions. This is striking, because standardization could limit the freedom in selecting innovative IT solutions. Despite of this, the interviewees stated that standardization is important for the process.

8.1.3. RQ 3

The findings of question 3 state that not all BITA criteria of Luftman's SAMM are fully applicable. The inability to fully apply the BITA criteria within Dutch universities is unexpected, due to its contrast with the original purpose of the SAMM. The alignment (maturity) criteria are based on enablers and inhibitors of strategic alignment, derived from data of CIO's of 15 industries, including educational institutes (Luftman, 1999, p7.). However, based on the results, the researched Dutch universities view the usability of all criteria slightly different.

Lastly, the combination of findings for research question 3 has important implications for the improvement of the creation of innovative IT solutions within Dutch universities: The findings help us understand that not all universities work the same and are aligned due to their structure. Special focus should be given per type of organizational structure in case of creating innovative IT solutions.

8.2. Limitations

All results within this research need to be interpreted with caution. The data that is gathered from interviews cannot be generalized for all Dutch universities and its target groups. This is because the interviewees and universities were not chosen randomly and the sample size is

insufficient to cover the target population. In addition, the distribution of respondents is not equal per level and responsibilities within the IT organization, or per field of study. This has to do with the availability and well willingness of the respondents to cooperate with this research and the lack of resources to conduct this research.

As previously mentioned, a limitation involved with this is that the results are mainly attributable to the findings from interviews/questionnaires with mostly mid-range managers. Other limitations that come with the difference in the distribution per working level and responsibilities, are less consistent answers and/or solutions. In fact, it could be stated that this research is a preliminary investigation which lead to some results, which needs to be further validated.

Another factor that skewed the sample size for interviews is the low amount of interviewees of operational level. It has been observed that the operational workers are not aware of all ins and outs of their university.

Moreover, the results of the interviews with the students and teachers should also be interpreted with caution:

- The majority of this group encountered difficulties with indicating problems that were related to their IT demand and the IT supply of the university
- The majority of this group is not being acquainted with the important IT processes.

It is important to bear in mind the possible bias in the drawings. Some interviewees from the IT departments were not acquainted with the usage of or had no knowledge about the AIM. In order to prevent this, (non-)verbal instructions have been given preceding the interviews. Despite of taking these measures, there should be no expectation that all drawings were made according to the given context. Another drawing (and questionnaire) related bias is that the interviewed IT staff members sometimes rated themselves higher in organizational level. This could indicate that some of the depictions in the drawings could be incorrect. Moreover, the AIM is used as a representation of the reality which comes with its restrictions: The framework as a tool has its limits, stating that the data should be interpreted with caution.

For the interpretation of the results of the questionnaires: Caution must be applied due to a small sample size as the findings might not be transferable to the IT staff of all Dutch universities. Thereby, many BITA sub criteria remained unused within the questionnaire (see Appendix C.3.), which means that there cannot be stated in how far all Luftman's BITA criteria are applicable within Dutch universities. The results of this study do not explain why some BITA criteria are chosen by the respondents and why the criteria are applicable to a certain degree. The small sample size and the incomplete usage of the SAMM criteria does not allow the conclusions of the third research question to be strong.

Additionally, BITA is for the 'Business' and the 'IT'. Within this research, the questionnaires to measure the pace of BITA has only be filled in by the IT staff members of the researched universities. The educational business has not been researched due to the supposition that the group is unfamiliar with IT terminology and has got limited knowledge about the stimulation of the creation of innovative IT solutions. This results into the fact that the third research question does not provide a clear view of what BITA principles are needed for creating innovative IT solutions, which is a limitation in this study.

8.3. Suggestions for future work

The incapability for generalizing the results are an important issue for future research. More research on this topic should be undertaken before a stronger conclusion could be given. At first, more interviews have to be conducted with more IT staff with similar roles, on similar operating levels from more universities. The similarity in the roles effectuates stronger conclusions as a result. A group session, to discuss the overall results to validate findings, could provide more valuable information to justify findings.

The questionnaire of Luftman's SAMM should be prepared with more caution to present a complete set of BITA criteria. The same test should be executed again with more respondents. For the creation of insights in important BITA criteria for universities, the educational business should also be involved within a future investigation.

The focus of this research was on the creation of BITA without constraints, but further research to the creation of BITA with current constraints could give more insights in how BITA could be created optimally.

Moreover, elaboration is needed on the centralized/decentralized organizational structure within an educational service.

Another point of discussion is based on the TPACK (Koehler and Mishra, 2005; 2009). The model implies that teachers have a significant role within universities. The IT solutions can be very good, but if the teacher does not dispose of any technical knowledge, then the chance of the succeeding of innovative IT solutions will be limited. In future research, attention could be drawn in how far teachers nowadays use technology in teaching and how this could be stimulated.

9. Literature

Abcouwer, A.W., Maes, R. & Truijens, J. (1997). Het negenvlak: Een generiek model voor informatiemanagement. *Concept*

Abcouwer, T. (2014). *Trends in Informatiemanagement.* Lecture conducted from *NGI-NGN Platform voor IT Professionals*

Baets, W. (1992) Aligning information systems with business strategy**.** *Vol 1 No 4 September 1992. Butterworth-Heinemann Ltd.*

Birks, M. & Mills, J. (2011) Grounded Theory: A Practical Guide**.** *Sage.*

Boeije, H. (2005). Analyseren in kwalitatief onderzoek.*Amsterdam: Boom Onderwijs*

Boynton, A. C. & Zmud, R. W. (1987). Information Technology Planning in the 1990's; Directions for Practice and Research**.** *MIS Quarterly, 11 (1),* p. 59-71

Brouwer, N., Dekker, P.J. & Van Der Pol, J. (2013). E-Learning Cookbook: TPACK in Professional Development in Higher Education**.** *SURF Foundation*

Bruce, K. (1998). Can you align IT with business strategy? *Strategy & Leadership, nov-Dec, 1998, 26(5),* p. 16.

Bryman, A.E. (2012). Social Research Methods, 4th edition**.** *Oxford University Press.*

Charmaz, K. (2006). Constructing Grounded Theory, a practical guide through qualitative analysis. *SAGE Publications*

Choo, C.W. (2014): *What is Information Management*. Retrieved on 07/04/2014 from http://choo.fis.utoronto.ca/Imfaq/.

Christensen, C.M., Johnson, C., & Horn, M. (2008). Disrupting Class: How disruptive innovation will change the way the world learns: 1st Edition. *McGraw-Hill.*

Cintron, R., Dillon, C., & Boyd, T. (2001). Teaching and learning in the new information age: State-system policies for technology. *Community colleges: Policy in the future context, Westport, Conn.: Anker Publishing,* p. 229-239

Corbin, J. & Strauss, A. (1994) Grounded Theory Methodology. In NK Denzin & YS Lincoln (Eds.) Handbook of Qualitative Research. *Thousand Oaks, Sage Publications,* p. 217-285

Creswell, J. (2004). Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research. *Prentice Hall.*

De Haes, S. & Van Grembergen, W. [2009]. An Exploratory Study into IT Governance Implementations and its Impact on Business/IT Alignment. *Information Systems Management, 26: Taylor & Francis Group, LLC.* p. 123-137

Galliers, R. D. (1993). IT Strategies: Beyond Competitive Advantage". *Editorial, Journal of Strategic Information Systems, 2(4),* p. 283 – 291

Gartner (2014). *Gartner Application Architecture, Development & Integration Summit.* Gartner Summits. Retrieved on 01/06/2014 from http://www.gartner.com/technology/summits/apac/application-development/?prm=evw?fnl=search

Gartner, (2014): *Definition of Information Management.* Retrieved on 07/04/2014 from http://www.gartner.com/it-glossary/im-information-management.

Universiteit van Amsterdam, (2014). *Gefundeerde theoriebenadering.* Retrieved on 15/04/2014 from http://wiki.uva.nl/kwamcowiki/index.php/Gefundeerde_theoriebenadering

Ghauri, P. & Gronhaug, K. (2005). Research Methods in Business Studies. A Practical Guide, Third Edition. *Prentice Hall, Financial times, Pearson Education*, p. 160

Gorden, R. L., (1992). *Basic Inteviewing Skills*. Retrieved on 30/04/2014 from http://www.indiana.edu/~educy520/sec5982/week_5/qual_data_analy_ex2.pdf

Gutierrez, A. & Serrano, A. (2008). Assessing strategic, tactical and operational alignment factors for SME's: alignment across the organization's value chain. *Inderscience Enterprises Ltd.*

Hale, A.J. (1995). Measuring IS Strategic Alignment in Small Firms**.** *University of Canterbury*

Henderson, J.C. & Venkatraman N. (1999) Strategic Alignment: Leveraging information technology for transforming organizations. *IBM Systems Journal, Vol38, 1999.*

Rijksoverheid (2013), *Hoger onderwijs.* Retrieved on 30/09/2013 from http://www.rijksoverheid.nl/onderwerpen/hoger-onderwijs

Kennisnet, (2014). *Informatiemanagement*. Retrieved on 07/04/2014 from http://www.kennisnet.nl/themas/informatiemanagement/

Koehler, M. J., & Mishra, P. (2005). What happens when teachers design educational technology? The development of technological pedagogical content knowledge. *Journal of educational computing research*, *32*(2), p. 131-152

Koehler, M.J., & Mishra, P. (2009). What Is Technological Pedagogical Content Knowledge? *Contemporary Issues in Technology and Teacher Education*, 9(1), p. 60-70

Lehmann, H., Myers, D.M. & Urquhart, C. (2010). Putting the "theory" back into grounded theory: guidelines for grounded theory studies in information systems. Information Systems Journal, p. 357–381.

Leiden University Lexicon, (2014). *Gesplitst semi-gestructureerd interview.* Retrieved on 07/01/2014 from http://www.leidenuniv.nl/fsw/psychologielexicon/index.php3-m=264&c=266.html

Leonard, D.A. & Swap, W.C. (1999). When Sparks Fly: Igniting creativity in groups. *Harvard Business School Press, 7.*

Luftman, J. & Brier, T. (1999). Achieving and Sustaining Business-IT Alignment. *California Management Review. Vol 42, NO 1. Fall 1999*

Luftman, J. (2000). Assessing Business-IT Alignment Maturity. *School of Management Stevens Institute of Technology. Communications of AIS, Volume 4, Article 14.*

Luftman, J.N., Papp, R., Brier, T. (1999). Enablers and Inhibitors of Business-IT Alignment. *Communications of AIS Volume 1, Article 11 (1)*

Luftman, J. and Kempaiah, R. (2007). An Update on business-IT alignment: 'A line' has been drawn. *MIS quarterly executive, vol. 6, September 2007*

Maes, R. (1999). A Generic Framework for Information Management. *PrimaVera Working Paper Series 1999-03. Universiteit van Amsterdam.*

Maes, R. (2007). An Integrative Perspective on Information Management. *Primavera Working Paper Series 2007-09. Universiteit van Amsterdam.*

Maes, R., Rijsenbrij, D., Truijens, O. & Goedvolk, H. (2000). Redefining business – IT alignment through a unified framework. *Primavera Working Paper 2000-19, Universiteit van Amsterdam*

Markosian, G. (2013). Het Amsterdams Informatiemanagement Raamwerk in theorie en praktijk. *Universiteit van Amsterdam.*

Mingers, J. & Brocklesby, J. (1997). Multimethodology: Towards a Framework for Mixing Methodologies. *Omega, Int. J. Mgmt Sci. Vol. 25, No. 5, Elsevier Science Ltd* p. 489-509

Moran, C. (1998). Strategic Information technology planning in higher education. *The future compatible campus. Boston, Mass.: Anker Publishing,* p.36-52

Motjolopane, I., Brown, I. (2004). Strategic Business-IT Alignment, and Factors of Influence: A Case Study in a Public Tertiary Education Institution. *Proceedings of SAICSIT 2004,* p.147 - 156

Peterson, R.R., (2003). Information Strategies and Tactics for Information Technology Governance. In W. Van Grembergen (Ed.), Strategies for Information Technology Governance**.** *Hershey, PA: Idea Group Publishing.* Chapter 2, p. 37

Persbericht Rijksoverheid (2011). *Meer innovatieruimte voor verdere kwaliteitsverbetering in het onderwijs*. Retrieved on 18/09/2013 from http://www.rijksoverheid.nl/onderwerpen/innovatie-in-het-onderwijs/documenten-en-publicaties/persberichten/2011/09/02/meer-innovatieruimte-voor-verdere-kwaliteitsverbetering-in-het-onderwijs.html.

Porter, M.E., (1985). Competitive Advantage: Creating and Sustaining Superior Performance. *The Free Press, New York.*

Pirani, J.A. (2004). Information Technology Alignment in Higher Education**.** *Educause Center for Applied Research*

Reich, B.H. & Benbasat, I. (2000). Factors that influence the social dimension of alignment between business information technology objectives. *MIS Quarterly. Vol. 24, No. 1,* pp. 81-113

Rijksoverheid (2013). *Stimulering van wetenschap.* Retrieved 16/09/2013 from http://www.rijksoverheid.nl/onderwerpen/wetenschap/stimulering-van-wetenschap.

Schumpeter, J. A. (1934). The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle. *(Vol. 55). Transaction Publishers.*

SURF (2013). *Over HORA.* Retrieved on 14/02/2014 from http://www.wikixl.nl/wiki/hora/index.php/Over_HORA

SURF (2013). *Bedrijfsfunctiemodel.* Retrieved on 14/02/2014 from http://www.wikixl.nl/wiki/hora/index.php/Bedrijfsfunctiemodel

Symons, G., Cecere, M., Young, G. O., Lambert, N. (2005). IT Governance Framework. Structures, Processes, And Communications. *Forrester*

Tallon, P.P. & Kraemer, K.L. (1999). A process-oriented assessment of the alignment of information systems and business strategy: Implications for IT business value. *I.T. in Business, Center for Research on Information Technology and Organization, UC Irvine.*

Tallon, P.P. & Kraemer, K.L. (2003). Investigating the Relationship between Strategic Alignment and IT Business Value: The discovery of a Paradox. *Idea Group Publishing.*

Tan, F.B., Gallupe, R.B. (2006). Aligning business and information systems thinking: a cognitive approach. *Engineering Management, IEEE Transactions, Volume 53, Issue: 2*

Thiadens, T. & Abcouwer, T. (Date unknown*). Organizing Information Management and IT for tomorrow with the Amsterdam Information Model***.** Retrieved on from 17/02/2014 from http://www.ICT-management.com

Ullah, A. & Lai, R. (2013). A systematic review of business and informationtechnology alignment. *ACM Trans. Manage. Inf. Syst. 4, 1, Article 4 (April 2013)*

Ulwick, A.W. (2005**).** What customers want. New York. *McGraw-Hill, Glossary,* p.180.

Universiteit Utrecht. (2013). *Lecturenet.* Retrieved on 18/09/2013 from http://www.lecturenet.nl/

Van Onna, M. & Koning, A. (2010). De Kleine Prince 2, Gids voor Projectmanagement. *Academic Service.*

Venkatraman, N., Henderson, J. C. & Oldach, S. (1993). Continuous Strategic Alignment: Exploiting Information Technology Capabilities for Competitive Success. *European Management Journal Vol 11, No. 2,* p. 139-149.

VSNU, (unknown). *Feiten en Cijfers.* Retrieved on 17/02/2014 from http://vsnu.nl/feiten-en-cijfers.html

Zellweger Moser, F. (2007). Strategic Management of Educational Technology – The importance of Leadership and Management. *Tertiary Education and Management, Vol 13,* p. 141-152.

Glossary

Amsterdam Information Model (AIM): A framework which helps the organization by supporting business issues which are related to Information Management. The model can be used to deal with the interrelationships between the business, information communication and technology levels between all organizational layers (from strategic, to structural and operational layer within an organization (Maes, 1999, 2003, 2007). In addition, its goal is to get a clear idea of the alignment between business processes, the information necessary to execute these processes and the ICT used in the alignment. (Thiadens and Abcouwer, date unknown).
Business: In terms of business and IT, the business is mostly seen as an entity that performs business processes to create services and/or products. The services and/or products are delivered in order to generate profit for an organization. During their activities, the business utilizes services, tools and products that are delivered by an IT entity.
Business and IT alignment (BITA): The degree of fit, integration, linkage and harmony between the business strategy, IT strategy, business infrastructure and IT infrastructure, in order to support an IT mission, objectives and plans support and are supported by the business mission, objectives and plans (Henderson and Venkatraman, 1999; Baets, 1992; Reich and Benbasat, 2006; Luftman, 2000). A synonym for BITA is also strategic alignment.
Business and IT alignment (BITA) criteria: The criteria which determine that business and IT alignment is created. BITA is created via the following criteria: Communications, value measurements, governance, partnership, scope & architecture and skills (Luftman, 2000).
Demand Management organization: Within Dutch universities, demand management is mostly seen as an entity (people and/or departments) that translates the demand for IT as a tool to a manageable solution for the supply organization and as the entity that collects the demand of the educational business.
Demand organization: A part (people and/or departments) of the organization which demands (in)directly for innovative IT solutions. The demand within Dutch universities is mostly found within the educational business. If the demand organization does not have IT (as a tool) to perform their core business processes, the whole organization would not function efficiently and effective, resulting in a bad performance.
Dutch (public) university: An instance that provides academic education and conducts research. A Dutch public university is funded by the Dutch government. The most important end products of Dutch universities are the amount of graduated students and the amount of research that has been done.

Educational Business: *Business* stands for a group of people (or eventually technology) of a company that perform certain business processes to deliver services and/or products. In case of educational purposes, it is hard to speak about a business that generates profit, because the public universities in The Netherlands are non-profit. Within this research, the educational business stands mainly for the students and teachers. The teachers have a high stake in education: They give education. In addition, students also make use of business processes (taking education) that are delivered by the university (teachers).
Innovative IT solution: A new and/or improved technological solution, based on Information Technology (IT), that creates (in)direct value for the students and teachers of a university. The choice for an innovative IT solutions could be based on a technological trend and can be driven by the IT organization, the business (students, teachers and other employees of a university) and/or external sources.
IT staff members: IT staff members are employees of an IT department (or of any aligned department with the same functions). These people could have various functions within an IT department. IT staff members are employed on operational, tactical and strategic level of an IT department.
Strategic Alignment Maturity Model (SAMM): A model which is used to learn what the maturity of the Business and IT alignment is within a company. The maturity is measured by comparing an organization with a certain level.
Student: A person who is subscribed as a 'student' according to the Dutch Law of Higher Education and Scientific Research. A student can do one or more studies within one or more universities. Students have the goal to obtain a degree on an academic bachelor's level or master's level.
Supply organization: A part (people and/or departments) of the organization which delivers innovative IT solutions. The innovative IT solutions are mostly supplied by an IT department, an aligned department with the same function or by external parties.
Teacher: A person who provides education. For Dutch universities, teachers are people with at least a bachelor degree in a certain field of study. Professors, assistant professors, lecturers, assistant lecturers, instructors, lectors and all other designations of people who provide education in Dutch universities come under the category of 'teacher'.

PART 5: APPENDICES

The appendices are divided in three parts due to confidentiality of the data. The first Appendix is A. This appendix can be found within this document and consists out of a list with abbreviations, an explanation of the AIM and the results of research question 3. The second document consists out of Appendices B – D. Appendix B contains the interview questions, C contains the original questionnaire of this thesis and appendix D exists out of the original drawings of the interviewees. At last, Appendix E contains the full transcriptions, the corresponding sound files and all coding tables. This appendix is digitally available, but is still confidential.

Appendix A: Integrated
Appendix B-D: External
Appendix E: External (digital)

Appendix A

A.1. List of abbreviations

AIM: Amsterdam Information Model

BITA: Business and IT alignment

SAMM: Strategic Alignment Maturity Model

A.2. Explanation of the AIM

The following explanation is from Maes (1999):

Strategy:

- Business strategy
  - Business scope
    - To determine the organization's products and services
    - To position the organization in the market place
    - To choose the appropriate level of scope or diversity
  - Business core competency
    - To determine the differentiating strategic competencies
  - Business governance
    - To decide on mergers, partnerships and strategic alliance
- I/C Strategy:
  - I/C scope
    - To determine the organization's external and internal I/C strategy
    - To position the organization by its generic I/C strategy
  - I/C core competency
    - To determine the differentiating competencies for using and sharing information and knowledge
  - I/C governance
    - To decide on strategic partnerships for information procurement.
- Technology strategy
  - Technology scope
    - To determine the organization's ICT strategy
    - To assess emerging technologies
  - Technology core competency
    - To determine the organization's differentiating ICT competencies
  - Technology governance
    - To decide on strategic partnerships with key technology providers
    - To decide on strategic buy/make and ICT standard choices.

(Infra)structure

- Business structure
  - Business architecture
    - To develop the organization's business model

        - To determine and (re)design the critical business processes
    - Business competency
        - To select and develop promising business competencies
        - To develop the organization's 'strategic architecture'
- I/C Structure
    - I/C architecture
        - To develop the organization's information, communication and knowledge architecture
        - To determine and (re)design the critical information and communication processes
    - I/C competency
        - To select and develop promising information and communication competencies
        - To develop an I/C learning infrastructures and the supporting IT organization) architecture
        - To determine and (re)design the critical IT processes
        - To decide on legacy systems
- Technology structure
    - Technology architecture
        - To develop the organization's technology (data, systems, configuration and supporting ICT organization) architecture
        - To determine and (re)design the critical ICT processes
        - To decide on legacy systems
    - Technology competency
        - To select and develop promising technology competencies
        - To develop an ICT learning infrastructure

Operations

- Business operations
    - Business processes
        - To (re)design, perform and monitor business processes (balanced score card)
        - To implement and monitor changes in business processes (balanced change card)
    - Business skills
        - Acquisition, training and development of the skills of business professionals
- **IC operations**
    - IC processes
        - To (re)design, perform and monitor IC processes
        - Information/Communication modelling
    - IC skills
        - Acquisition, training and development of the skills of IC professionals
- **Technology operations**
    - Technology processes
        - To (re)design, perform and monitor ICT processes (development, maintenance, etc.)
        - Operational ICT management
    - Technology skills
        - Acquisition, training and development of the skills of ICT professionals.

A.3. Results of statements of Research Question 3

#	Demands for creating BITA within a university in order to improve the creation of innovative IT solutions	Percentage of respondents that chose the statements (%)
1	The IT should understand the education for BITA.	100%
5	The sharing of knowledge between the education and the IT within a university is an important factor for creating BITA.	100%
6	Effective collaboration should be more important than working individually to create BITA within a university.	100%
13	There has to be a process of 'continuous improvement', applied on humans, processes, services and products, etc. to create BITA within a university.	100%
18	The prioritization of IT investments should happen pro-active: Projects should be prioritized before they start up.	100%
30	For BITA, a university has got to stimulate and welcome innovation and entrepreneurship within the organization.	100%
4	The degree of informality should be high in order to create BITA within a university.	94%
12	Formal project evaluations should be carried out in order to create BITA within a university.	94%
22	To create BITA within a university, the relationship between the educational-organization and the IT department should both be based on the valuation of a service provider and in addition there has to be a partnership between the two.	94%
27	To create BITA, an enterprise architecture has got to be developed for the whole university, and should eventually be integrated to partners and external entities.	94%
29	The IT architecture should be transparent and flexible to an increasing extent. In that way, the entire infrastructure could possibly undergo a change.	94%
3	There should be a possibility for evaluation and mutual learning within a university in order to create BITA within a university.	88%

7	To create BITA, IT measurement values should be related and be able to be translated to educational measurement values and eventually to external partners	**88%**
9	To create BITA, there should be a relation between the measurement values of the education and the IT to make the performance of both entities measurable.	**88%**
14	Strategic planning should apply to the entire organization and should (if possible) even be integrated outside the organization.	**88%**
21	To create BITA responsibilities and eventual risks concerning the usage of IT should be jointly allocated to the educational-organization and the IT department.	**88%**
17	Decision-making entities should cooperate formally and should communicate formally and effective.	**82%**
26	The information architecture on faculty level should be integrated throughout the whole faculty and should interconnect academic departments and institutes.	**82%**
2	The education should understand the IT for BITA.	**76%**
11	Benchmarking should be done in order to create BITA within a university.	**71%**
31	The management of the university should consist of the directors of the IT and the business and any partners.	**71%**
10	Formulating service level agreements (SLA's) is important to create BITA.	**65%**
16	Investments in IT should be managed in that way, that these investments should be seen as costs for effective business processes, the acquisition for big applications, etc. *1	**65%**
20	Representatives of the IT department should be effectively be included within drawing up the strartegic educational governance, where the IT should also be seen as a resource.	**65%**
33	The willingness to change of the teachers, students and the IT should be high in order to be able to make significant changes.	**65%**
23	The end responsibility for decisions that have an impact on students and teachers within the university should be available and should be assigned to the management/board of directors.	**59%**

24	The scope of the activities of the IT departments should be that they are an entity that makes business processes possible, allowing IT products and services to be an important part of the daily activities for the education.	**59%**
25	Standards should be defined for educational processes university-wide and should be compulsory.	**59%**
***1**	Note: Due to an open answering possibility, the percentage of respondents is different!	